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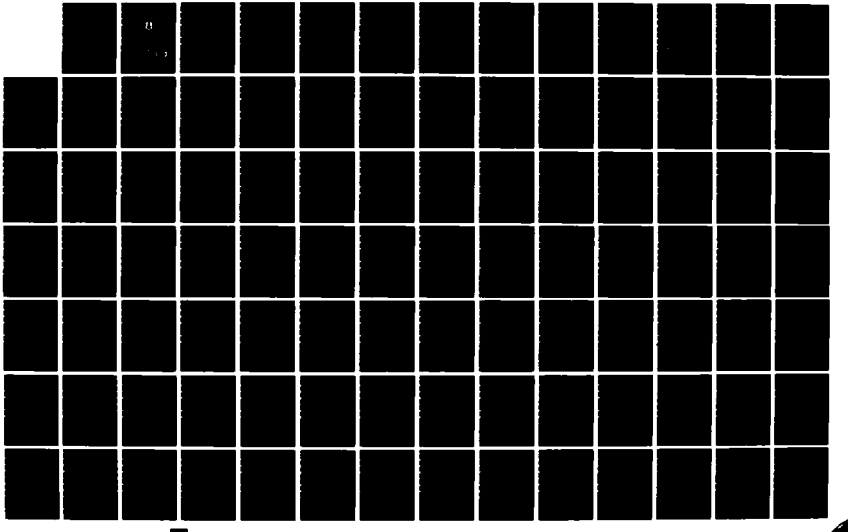

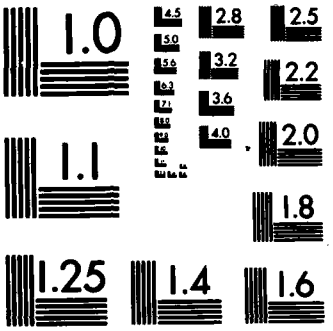

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METEOROLOGY OF THE PERSIAN GULF AND OF SEVERAL AIRPORTS ON THE ARABIAN COAST

by

Georges Marcal

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AIR FRANCE
AIR OPERATIONS MANAGEMENT
Technical Department
Lines and Regions Section
Meteorological Studies

APRIL 1980

METEOROLOGY

OF THE PERSIAN GULF

AND

QF SEVERAL AIRPORTS

ON THE ARABIAN COAST

by

Georges Marcal

FOREWORD

At the request of AIR FRANCE's Main Flight Centers, I have undertaken to prepare this Meteorology of the Persian Gulf, no such manual being yet currently in existence on the outside, as a work addressing aviation needs about the region.

At an even broader informational level, it is surprising to note how few studies, up to the present day, have dealt with the causes, consequences and meteorological phenomena which, each year, determine the main characteristics of the Gulf's climate, as well as their very important seasonal fluctuations.

Consequently, during the realization of this study ranging from regional weather conditions to local climate characteristics, I have endeavored to present to the reader, in condensed and coordinated form, simple, logical and evocative explanations about the meteorological phenomena manifestations liable to be encountered according to season, altitude, time and place, in these regions that only yesterday were rather little known, from the point of view of meteorology.

However, having but few basic documents at my disposal, I have had to engage in an extensive work of analysis, correlation and synthesis, so as to arrive at a methodical elaboration of this study which, in the opinion of some readers, may still be very incomplete in its present form.

At least, thus realized, this Meteorology is already intended as an answer, in the main, to the very legitimate desire on the part of our Crews for general and circumstantial data of this nature, in the

face of the commercial and operational utilization of the Gulf's airports, which is today on the threshold of its full development period.

For the last two or three decades, the black gold gushing from the sands has been more and more rapidly transforming certain areas of Arabia.

Spurred by the great strides in industry and trade, a spectacular example of which is being offered to us in current times, a new "Arabia Felix" has established itself on the western shore of the Persian Gulf, only yesterday semi-arid and largely barren.

Today, the mighty Oil States not only build and develop vast modern cities and industrial centers for the utilization of their new wealth, but carry out projects for the irrigation of their lands, the enlargement and modernization of their road networks, the diversified enhancement of their soil. These are of such importance that the basic living conditions will be altered in the short run: increased sedentarization of autochthonal populations, new crop and vegetation zones, development of experimental farms, creation of new health and sea-side resorts, preparation of unusual and picturesque areas, until now hard-to-reach, for a tourism that is fully evolving in regard to regions still rather unappreciated and, for that very reason, highly attractive...

Obviously, these various and extensive modifications, urban, industrial, economic, social, agricultural and touristic, will in turn lead, in the shorter or longer term, to noticeable and progressive climate changes, expressed through a greater emphasis on appreciably more moderate micro-

climates. The latter, due to their influence, will themselves give rise, at least in some areas of the Gulf's coastal edge, to a new bioclimatology more attuned to the physiological conditions essential to Europeans staying in these regions, especially in Summer.

Hence, it is important that this study, otherwise destined to be enlarged as soon as circumstances permit, should, within a few years from now, be reexamined as a function of the new local weather observations obtained at the involved airports and meteolorogical stations in the Persian Gulf.

A timely updating of this Manual might perhaps then be undertaken with advantage, at least in regard to the local weather data especially liable to sustain appreciable climatic modifications in time, the exact knowledge of which remains indispensable to the requirements of operational air management.

G. MARCAL

METEOROLOGY OF THE PERSIAN GULF

AND OF SEVERAL AIRPORTS ON THE ARABIAN COAST

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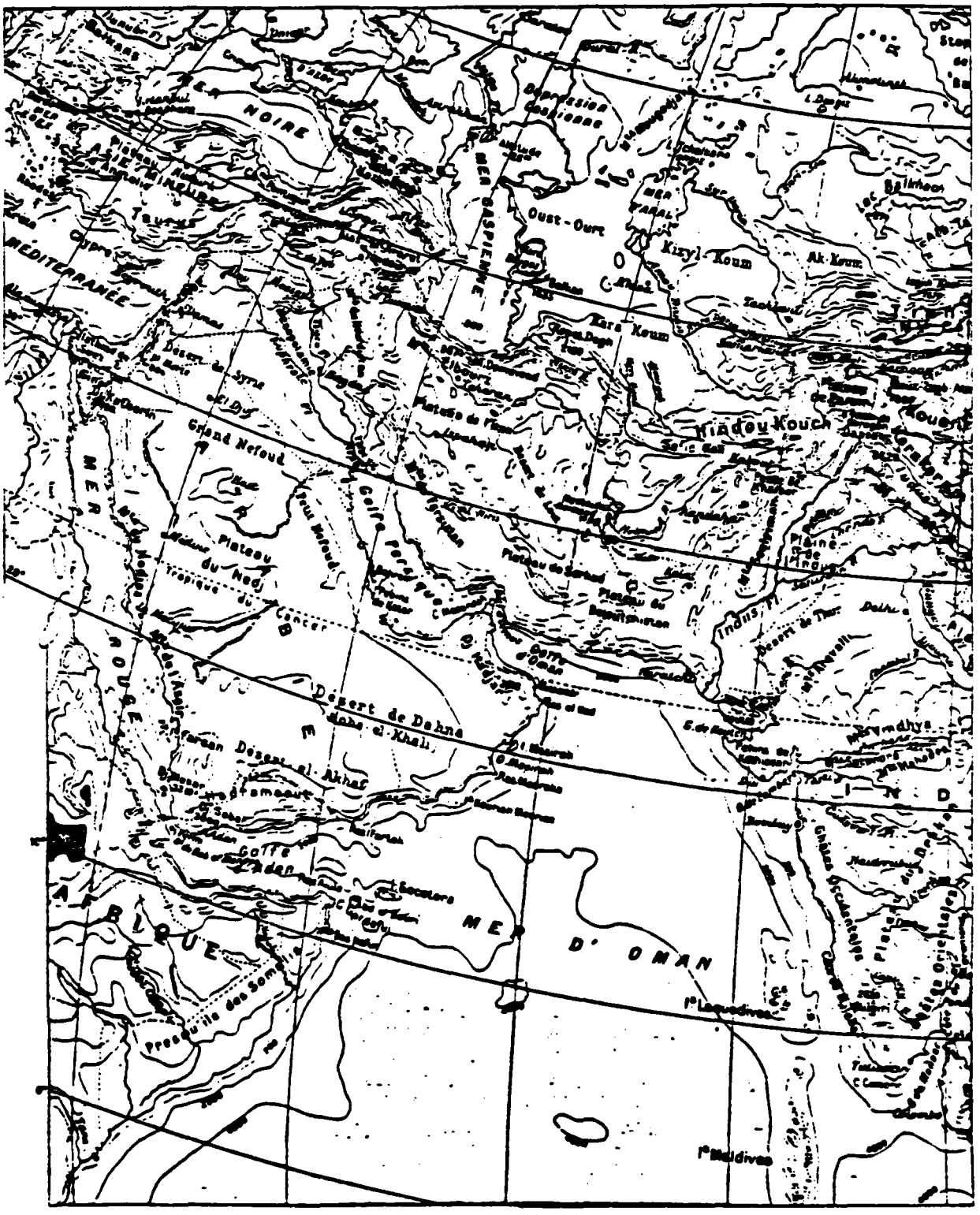
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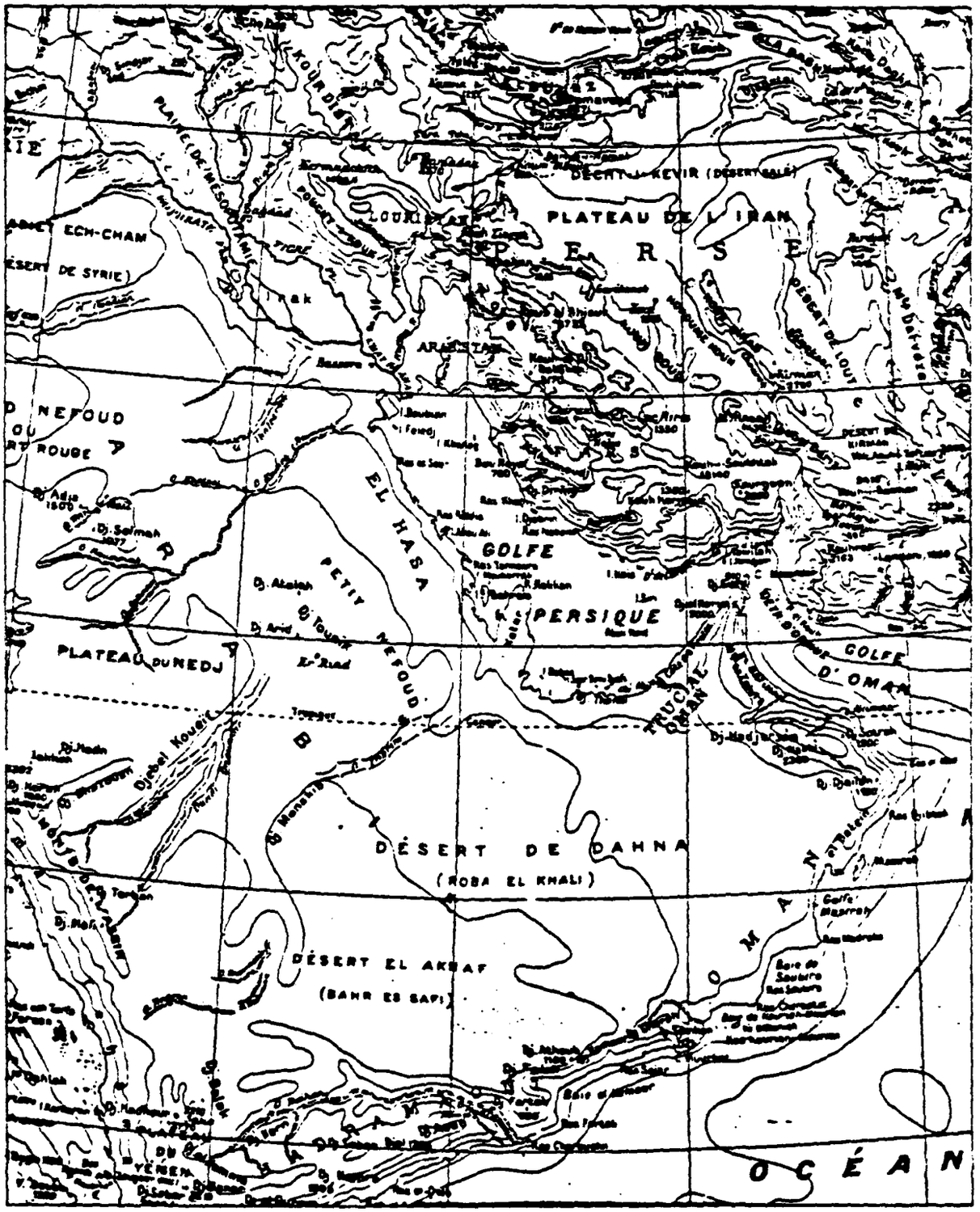

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METEOROLOGY OF THE PERSIAN GULF

AND OF SEVERAL AIRPORTS ON THE ARABIAN COAST

I - REGIONAL METEOROLOGY SUMMARY

1.1. TOPOGRAPHIC LOCATION

For a better understanding of the cause-and-effect process of the meteorological phenomena periodically affecting the Persian Gulf and its coastal areas, it may first of all seem necessary to examine the physical map of the main peripheral natural regions concerned in this study (Cf. MAPS No. 1 and 2).

Very schematically, we note that these regions as a whole present themselves in the shape of 3 alignments appreciably parallel in their northwest-southeast orientation, or 3 great diagonals in relation to the geographical North:

1 - From the NW to the east of the Gulf: an impressive mountain barrier starting in Asia Minor (Plateau of Anatolia, Taurus and Armenia Mountains) and prolonged toward the southeast by the Kurdistan, Luristan, Zagros and Farsistan Mountains, themselves overlooking the high plateau of Iran.

These important mountains are further continued, to the east and southeast of the Persian Gulf, toward the Gulf and Sea of Oman, by the Baluchistan Plateau.

2 - At the center: a very long natural topographic depression consisting of the plain of Mesopotamia prolonged by the

Persian Gulf along a NW-SE rectilinear axis; in the southeast, the heights of Djebel Hadjar serve as a partial boundary for this very long depression and give it a rather relative protection against the incursion of meteorological phenomena originating in the Indian Ocean.

However, the Strait of Ormuz, southeast of the Gulf, may occasionally allow the additional penetration into the Gulf of like phenomena ascribable to intertropical oceanic meteorology.

3 - From NW to SW of the Gulf: the Arabian Peninsula.
The latter is limited to the west by the Red Sea, whose longitudinal orientation axis also corresponds to the same NW-SE alignment.

With their more important elevations not far from the Red Sea's eastern coast (Djebel ech Chafah, Hejaz and Assir Mountains, Plateau of Yemen), the mountain ranges of the Arabian Peninsula then gradually slant down toward the northeast and the Persian Gulf.

On the eastern slope of these mountains which consist of the inner djebels and plateaus, the multilevel, arid and desolate landscape now and then appears to be intersected by a deep and sinuous gash due to former rivers and torrents now dried-up: the wadis.

Once fully active during the glacial period, these wadis remain dry almost throughout the year, except upon the

occurrence of rare and violent storms that suddenly swell them, causing highly dangerous floods.

The same extreme aridity of the landscape persists through the desert stretches on the Asian slope of the peninsula: Great and Little Nefud Deserts, El Akhaf and Dahna Deserts, the latter among the most forsaken deserts in the world.

It must therefore be noted that, consequently, this huge eastern Arabian slope is oriented toward the Persian Gulf, that its ranges and plateaus follow the same NW-SE alignment; in this situation, then, its stretches of sand and dust may suddenly be affected, very especially in the lowest-lying areas close to the Persian Gulf, by the passage of moving Mediterranean depressions with a NW origin, which lift the sand in violent swirls and carry it upwards with them, afterwards leaving it suspended in the air for several more days following the return of a relative calmness in the overheated atmosphere of the lower layers, site of a very strong thermal convection.

Lastly, farther toward the Northwest of the Gulf:

a second natural topographic depression continuing in a west-east direction. It consists of the Eastern Mediterranean Basin prolonged by the Syrian Desert.

It is important to specify that this very long natural depression, opening into the Plain of Mesopotamia, leads, without difficulty due to land relief opposition, to

the frequent migratory Mediterranean low-pressure cells, in Autumn, Winter and early Spring, up to the coastal zones of the Persian Gulf where they may seriously affect the airports of the Arabian coast, more exposed than the Iranian coast to the passage of these lows.

1.2. GENERAL METEOROLOGICAL CONDITIONS

An examination of the yearly general weather conditions in the Persian Gulf and its coastal area demonstrates, very especially for this region, the dominant influence of the main action centers which, in the process of cause-to-effect laws, underlie the basic seasonal characteristics of the climate as well as its sometimes rapid variations.

1.2.1. Seasonal characteristics of the climate

The climate is characterized by 2 main seasons, clearly distinct in nature, as follows:

WINTER: from November to mid-March: 4½ months

It is the longest period of the year.

As early as November, the main winter and regional weather characteristics progressively organize themselves as follows:

- Predominance of the static continental anticyclone of Siberia, with relatively high pressures over the Iranian mountains.

  Flow of dry and cool continental polar air (slight warming by subsidence: foehn effect). This is also the most pleasant period of the year.

- HP formation over North Africa and Lybia (ridge to the EAST of the dynamic Azores anticyclone over the African continent, in Winter).

- Between the HP settled to the East over Iran, to the NW over Anatolia, and to the West over Lybia and Arabia: presence of a relative col over Mesopotamia and of a more pronounced col over the Persian Gulf.
- Predominant NW winds originating from the HP of North Africa, by way of the Mediterranean Sea and Iraq. In the lower layers, occasional reinforcement of these flows by north to NE continental winds, starting from the static winter anticyclone over Siberia.
- Rather frequently, passing through of DP systems from the Eastern Mediterranean (fronts), across Mesopotamia and the Persian Gulf (Cf. 1.3.1. : NW migratory lows).

SUMMER: from mid-May to mid-September : about 4 months.

Overall regimen of rather durable low pressures, which forms a basic contrast with that of the long winter period, namely:

- Strong influence of the vast shallow depression made up of the Intertropical Convergence Zone over the Sea of Oman during this season, in association with:
- Several continental thermal DP cells settled over Southern Arabia, Baluchistan and Western Pakistan.
- NW winds, of variable strength, almost continuous (15 to 20 kt), linked to the activity of the important thermal LP cell settled over Southern Iran.
- Occasional light SE winds turning up in the Persian Gulf through the Strait of Ormuz: pulsions of SW monsoon deflected into the Gulf of Oman and caught in the cyclonic flux of the strong LP cell located over Southern Arabia.

These two main seasons are framed by 2 shorter transition periods during which the climate undergoes progressive modifications:

SPRING TRANSITION : from mid-March to mid-May : about 2 mo.

- Gradual retreat and disappearance of Siberian HP, whereas the continental thermal LP cells appear over the most overheated southern regions.
- These are going to spread more and more in the direction of the Persian Gulf.

AUTUMN TRANSITION : from mid-September to late October : about 1½ mo.

Evolution of the reverse process during this brief period, namely:

- Gradual filling of the continental LP cells.
- Extension of North Africa HP toward Lybia, with ridge over NW Arabia.
- More and more noticeable return of Siberian HP over Iran.
- Arrival of the first Mediterranean LP systems (toward late October-early November).

1.2.2. Main action centers and general circulation

After this initial approach to the seasonal climate characteristics, it would be interesting to examine more closely the evolution of annual periodic weather phenomena through a study of the main action centers involved as well as of the general circulation in the atmosphere, consecutive to their interaction.

- Pressure distribution

Atmospheric pressure zones are very unevenly distributed

according to the nature of the subjacent earth surface, latitude, altitude, exposure, as well as to the general orientation and situation of the areas to be considered.

Around a conventional axis of average pressure (1013.2 Mb) brought back (or reduced) to sea level, at a temperature of 15° C, the general distribution takes place into:

- High pressure zones (HP), and
- Low pressure zones (LP).

For the surrounding regions, these zones represent, through their influence and the setting-up of a general circulation in the atmosphere, action centers with a different nature according to their position, as follows:

- permanent (or dynamic) action centers; these are only affected by annual periodic modifications: shift in their geographic position, extent, more or less influence according to the seasons, but always remain active.
- semi-permanent (or thermal) action centers; these only have a periodic existence (hot or cold months) during which they form, develop, reach their maximum activity and then decline rather rapidly with the return of either Spring or Autumn.

Main action centers to be considered in the study

HP:

- Permanent action center:
  - the oceanic Azores anticyclone, to the West.
- Semi-permanent action centers (cold months):

- the static continental anticyclone of Siberia, with ridge over Eastern Europe, from NW to NE, and HP over Anatolia.
- the static continental Saharian anticyclone, toward the WSW (central and southern Sahara), with relative HP over Lybia and North Africa, on the one hand, a ridge extending over the Arabian Peninsula, on the other hand:

LP:

- Permanent action center:
  - the Intertropical Convergence Zone (ICZ) to the South.
- Semi-permanent action centers:
  - the relative LP zone located over Western Europe,and
  - the depression in the Gulf of Genoa (Autumn and Winter).
  - the depression of the Sea of Oman (from Autumn to Spring; in Summer, this depression vanishes into the ICZ).
- General circulation

A - From Autumn to Spring

2 predominant flows are to be mentioned:

1/ from the Siberia anticyclone to the ICZ: NW flow

Since the middle of Autumn, the lands of the central Asian continent have become very cold; above them, a mass of heavy, cold and dry air is gradually organized: the continental polar air.

During the cold months in our hemisphere, this air mass, while developing, is going to form the vast stationary Winter anticyclone of Siberia.

Of rather low altitude, this continental anticyclone intensifies as early as November, then extending a ridge over Iran, and, more relatively, over Arabia until March-April, whereas, also since November, a HP cell has gradually become organized over the Anatolian range.

In addition, in the other hemisphere, to the East of the African continent (Zaire/Tanzania), a vast LP zone has developed under the thermal equator, in association with the high temperatures that prevail over South-East Africa in this season.

Between these 2 important continental action centers:
from the Siberian HP to the African LP, a substantial circulation of air masses has taken place, giving rise to winds initially from the NNW over Asia Minor, then from the NW over Mesopotamia and the Persian Gulf, subsequently becoming oriented to the north and later to the NE over the south of the Arabian Peninsula and the Indian Ocean.

2/ <u>from the Azores anticyclone to the Sea of Oman depression</u>:
<u>flow from the W over the Mediterranean</u>, <u>from the NW over Mesopotamia and the Persian Gulf</u>, <u>from the north to NE over the Indian Ocean</u> (NE trade-winds of the Indian Ocean).

From Autumn, the Azores anticyclone, "following the sun" toward lower latitudes, will at the same time get closer to the African continent, thus opening a way further south to the Mediterranean for the many Atlantic disturbances originating from the Bay of Biscay.

Throughout this same period but chiefly during the winter months, the stationary winter Saharian anticyclone is about to establish itself over North Africa considered as a whole.

This anticyclone, most often protecting the northern regions of Africa, organizes along its polar slope a circulation with west-to-east flow over the Mediterranean basin. This speeds up and draws toward the Middle East areas most of the winter Atlantic disturbances once they have passed over the Mediterranean. This circulation "bed" for migratory low pressure cells also forms a ready-made space for the installation, fairly common in this season, of a vast frontal zone of North-Atlantic origin, which then becomes the winter Mediterranean front.

Now, according to weather fluctuations, this frontal zone may spread more or less completely over the whole Mediterranean basin, thus making the way easier for the many migratory LP cells: the disturbances, initially of Atlantic origin, that become Mediterranean

upon reaching the coasts of the Near-East.

B - Summer

This season is strongly influenced by the following action centers:

a/ the oceanic Azores anticyclone. In comparison with its winter position, it is located in SUMMER
- further north in latitude,
- more to the center of the Atlantic, and it is
- also more swollen, active and spread-out than in the winter season.

In addition, it very often extends a substantial ridge over Western Europe and the Mediterranean.

b/ a very wide depression zone that has invaded the overheated lands of Arabia and the High Iranian Plateau, then the Sudan, Egypt and Iraq.

c/ a very important "upswing" in latitude on the part of the ICZ, which, in this season, can be found at the entrance to the Persian Gulf, over the coastal regions of Hadhramaut and Oman, directly exposed to the SW monsoon flow from the Indian Ocean.

The result is a very marked difference in pressure areas between the "EUMED" zone (HP) and the "MIDDLE EAST" zone (LP), hence an increased NW-SE circulation of air masses in Summer with, however, a fairly common NNW orientation, linked to the origin of Atlantic anticyclonic flows, which are more northerly during the summer season.

1.3. CHIEF METEOROLOGICAL PHENOMENA

1.3.1. NW migratory depressions

These LP systems coming from the Mediterranean involve modified polar air and cold, continental polar air that moves in a SE direction, to the rear of the depression.

These depressions sometimes head for the Caspian Sea, but most frequently toward the Persian Gulf where they reach their maximal intensity upon encountering masses of warm and humid tropical sea air.

A - On the Arabian coast

In any localized point on the Arabian coast of the Persian Gulf, the passing-through of an active depression is characterized by 3 separate meteorological situations, which make up the 3 successive phases of the disturbance:

- 1st phase : passage of the warm front;
- 2nd phase : passage of the warm sector;
- 3rd phase : passage of the cold front.

1/ Passage of the warm front:

It is revealed by the arrival of a mass of air that is relatively warmer and more humid than the air present at that particular time above the localized point under consideration.

The new, lighter, masses of air push back the (colder) existing air by topping it in altitude along a discontinuity surface occurring as an inclined plane at the head of the depression: the warm front surface.

The forced uplifting of the warm air along the frontal surface then causes this mass of warm air to undergo an adiabatic expansion, which in turn brings about the development of stratiform cloud systems, very significant of a warm front passing through: cirro-stratus, altostratus, nimbostratus and stratus.

This first phase is characterized by a change in wind direction (winds initially from NW, becoming SE to SW oriented), a rise in temperature, a gradual condensation of moisture; in the lower layers, this is very often expressed by a large amount of clouds: drizzle and fog.

Perpendicularly to the localized point on the ground, the arrival of the warm front will consequently be revealed first of all at high altitude by a gradual modification in cloud structure, with cirrus and cirro-stratus, then by altostratus at the level of the middle layers, and finally by stratus and nimbus in the lower layers, thus marking the trace on the ground of the warm front's passing through.

However, it is necessary to specify that, if the warm front carries along with it a mass of relatively dry air, such a passage may be accomplished through a change in wind direction, a rise in temperature, but without extensive formation of significant clouds.

2/ Passage of the warm sector

The second phase begins when the new air mass has completely invaded the surrounding space.

During this phase, as there are no conflicting air masses, weather conditions are comparatively more stable and the passing clouds belong to the typical stratiform variety usually found in warm air masses.

3/ Passage of the cold front

The last phase occurs when the colder continental air, located to the rear of the disturbance, takes in its turn the place of the previous warm air. The air then becomes cooler, drier and denser. This heavier air, moving "as a wedge" over the ground, pushes forward and upward, while gradually reducing it, the air of the warm sector that was coming ahead, thus triggering an important convective instability phenomenon.

The general conditions are then very strongly altered, deteriorating abruptly: sudden and brutal shift in the wind direction, very noticeable drop in temperature, decrease in the relative humidity rate, increased pressure and, especially, overall weather degradation: squall lines, thunder-storms, sand-storms, heavy showers...

It must be noted here that, in opposition to the effects due to the passage of a warm front, the change in weather conditions resulting from the passage of a cold front begins near the ground, at the level of

the lower layers, then progressively spreads up high, the separation plane between the two conflicting air masses having a direction contrary to that of the warm front.

In addition, the perturbations in the weather manifest themselves simultaneously with the passage of a cold front, so that, contrary to the advent of a warm front, the advent of a cold front is not heralded long in advance by the arrival of cirrus, but only by developing cumulus (castellanus and congestus), and by cumulonimbus that sometimes show up in long cloud bands shortly before the passage of the cold front at the point considered.

After the passage of a cold front, the effects of the depression soon vanish and the weather is not long in going back to normal.

B - <u>On the Iranian coast</u>

One must also state that, on the Iranian coast of the Gulf, the important land relief of Iran gives rise to serious orographic effects upon the arrival of an active depression.

When the warm front of the disturbance draws near, the result is weather conditions that become even poorer than on the Arabian coast: heavy rains followed by a period of clouds with transient drizzles, this period

being also sometimes liable to last much longer than on the Arabian coast.

After the warm front goes by and before the cold front arrives, the warm sector winds from SE to SW make for rather fine weather over the Gulf, far from the coast, with light winds and an average amount of clouds, of a type characteristic of the warm sector. However, as reported earlier, the important relief of the Iranian shore serves to greatly strengthen the persistence of a large amount of clouds with transient and intermittent drizzles over these coastal regions.

The Gulf's swell: harbinger of a disturbance

As soon as a NW disturbance reaches the Persian Gulf, the strong north-to-west winds of the cold front, in association with the meteorological phenomena of general weather deterioration that we have noted during the passage of the cold front: squall lines, thunder-storms, sand-storms, heavy showers..., very rapidly bring about the formation of big waves over the NW surface of the Gulf. These waves are quickly going to create a NW swell throughout the Gulf, highly indicative of the advance of an active NW depression over this whole area.

In fact, this swell spreading through the Gulf in a few hours, whereas from 24 to 48 hours will be required for the disturbance to cross it along its main axis,

surely represents, for the populations of these coastal areas, an unquestionable premonitory sign of the advent of such a disturbance.

The latter, however, while advancing toward the Strait of Ormuz and the Gulf of Oman, will gradually lose some of its intensity; the contrast between the two air masses facing each other is progressively altered and becomes less and less marked toward the SE zone of the Gulf and the Strait of Ormuz.

One must also specify that, on the other hand, when the permanent, relatively low-pressure cell located over Ethiopia moves up -very occasionally- in conjunction with this NW-SE progression of Mediterranean depression systems, general weather conditions may get even worse and last longer, very especially over the airports on the Gulf's Arabian coast; the contrast in the nature of the two conflicting air masses then increases very rapidly.

1.3.2. Sand-bearing winds and sand-hazes

Even though, in the regions along the Arabian coast, suspended dust, sand-haze and sand-bearing wind are weather phenomena liable to occur in Winter during the passage of NW disturbances, here they are dealt with mainly as regional phenomena that take place much more frequently through the very hot months.

Indeed, with Spring, a LP zone has taken residence over the already overheated desert stretches of the SE Arabian Peninsula (Dahna Desert). Around this secondary action center, a cyclonic circulation progressively gets organized. Its effect upon the areas along the Arabian coast is going to be expressed through the occasional arrival of burning SE winds, carrying the dust and sand they have raised on their path, this action itself being reinforced by the heat radiation effect, which is intense in the lower layers.

The period during which these various lithometeors may happen most frequently is June-July, the annual period of maximal insolation. In addition, it corresponds to the ICZ's phase of annual maximal "upswing" in latitude. The ICZ is then very close, at the SE edge of the Arabian Peninsula, over the Indian Ocean, with an active monsoon on the Sea and Gulf of Oman. After following the Somalian coast, the SW monsoon currents lengthen their path toward the Oman coast by gradually deviating their orientation in parallel to the Arabian coast, under the cyclonic influence of the LP cell positioned over Southern Arabia.

In this manner, monsoon flows (pulsions) are going to get into the Gulf of Oman and will even sometimes penetrate into the Persian Gulf through the Strait of Ormuz as East to SE depressions.

Hence, during the hottest months, these flows will reinforce the winds born from the cyclonic circulation in effect over Southern Arabia, thus determining in the regions along the Arabian coast a maximal period of sand-bearing winds and/or sand-haze. During this period, the worst time block each day is in early afternoon, from 1:00 to 3:00 P.M. local time (maximal sunshine amount per hour).

Sand-bearing wind and lithometeors

The usual phrase "sand-bearing wind" includes, in fact, various lithometeors, all presenting one common point: that of carrying into the atmosphere sand or dust particles in suspension, capable of more or less strongly restricting visibility.

Origins and causes of their manifestations

a) Activity of a strong enough wind, with presence of a vast underlying surface covered with sand and/or dust.
b) Vertical wind turbulence phenomenon.
c) Thermal effect of phenomenon acceleration.

According to a more general definition, we may state that the causes are both dynamic and thermal, the wind strength, its turbulence, the intensive warming of the air layers being also capable of intervening simultaneously, or separately.

However, let us really make it clear that, in the

strongest manifestations observed (particularly violent sand-storms), the wind intervenes through its speed, but above all through its TURBULENCE.

Correlation between limited horizontal visibility and particle diameter and concentration.

Many observations carried out in regions with sand-bearing wind activity show that, when the wind raises sand (or dust), its instant speed, on the ground, often exceeds 25 kt; the vertical components of the wind's speed then establish themselves, as follows:

Through a moderate raising, in a localized zone:

Drifting-and-blowing sand: average: ± 1.5 m/s
maximum: 2.8 m/s

Through an important raising, over vast areas:

Sand-storm: average: ± 3.0 m/s
maximum: 4.0 m/s

These observations reveal a law of correlation between the limits of the horizontal visibility noted during the occurrence of the phenomena, and:

- the concentration, per cm^3, of the transported sand or dust particles;
- the average diameter of these particles,

as follows:

in sand-haze:

- 5 to 6 km visibility: 200 particles per cm^3, average diameter: 1.0 μ

- 2 to 5 km visibility: 350 particles per cm^3, average diameter: 2.0μ

in restricted visibility (visibility conditions analogous to fog) consecutive to the activity of a very strong sand-bearing wind:

sand-storm:

- 750 to 1000 m visibility: 550 particles per cm^3, average diameter: 3.0μ

It is very obvious that these are average values, provided as an indication, to approximate the phenomenon's relative importance, in regard to its manifestations.

Specialized studies have proved that ascent rates of 1.3 m/s are enough to keep in suspension sand grains of 150μ, and that with sand-bearing winds, ascent rates most often reach 2 to 4 m/s, speeds capable of keeping in suspension grains of sand 400 to 500μ in diameter.

In addition, the finer particles are able to remain suspended long enough in the air, as the terminal falling speed of small particles is very low. So it is that particles with a diameter of 0.2μ have a falling speed not exceeding 0.6 m per 24 hours; the particles of more average size: 2μ, show a much faster falling speed: 30 m per 24 hours.

Classification of lithometeors

According to an order of increasing intensity in

the manifestations of these various meteorological phenomena, we may observe:

- Thermal or dynamic sand-whirls

  These are local phenomena with limited effects. However, with turbulence, the force of the ascending current may be such that sometimes it causes a few damages to structures lying in its path.

- The thickness of the turbulent layer may reach 3000 m.

- The sand-tornado

  The general term "tornado" means an intense vortex motion around a vertical axis, in association with the passage of a cumulonimbus and, occasionally, of a thunderstorm over the region.

  This is a phenomenon still rather localized but with a wider scope. It may brutally affect an area several kilometers in diameter, and rises up to over 1000 meters.

  Visibility drops to very low values: 200 to 300 meters, sometimes to hardly 100 meters. Short-lived, from ½ to 1 hour maximum, the tornado generally occurs late in the afternoon (between 3:00 and 6:00 P.M. local time).

- Drifting-and-blowing sand, and sand-storm

  Drifting-and-blowing sand consists of an amount of dust or sand particles lifted from the ground and up to moderate heights over limited areas by a wind that is strong and turbulent enough. It

affects visibility, either in the very low layers (low-level blowing-and-drifting sand) or at a slightly higher altitude without any decrease in visibility on the ground (high-level blowing-and-drifting sand).

In both cases, the relative decrease in visibility results in sand-haze.

In the more serious case of a sand-storm, the wind is strong and very turbulent, with a much wider action in space, and causes greatly reduced visibilities, of less than 1000 meters in all instances.

- Sand-haze

As far as sand-haze is concerned, it is necessary to specify that its occurrence in Winter is rather uncommon.

In effect, though the strong winds, over all these regions and, very especially, over the Arabian Peninsula, are then more common than in other seasons, and though, in addition, precipitations, even in Winter, are low, indeed scarce and minimal, the relative humidity of the desert's surface remains sufficient to almost completely prevent the formation of any important sand-haze in the low and middle layers.

As a matter of fact, it is worthy of note that, from December to February, on the coastal areas of the Persian Gulf and particularly on the latter's Arabian Coast, any haze organizing on occasion is

associated with the passage of cold fronts accompanied by thunder-storms and squalls.

So it is that any winter haze developing in such conditions results from a mixture of haze locally uplifted during the transit of the disturbance, and haze "coming from elsewhere", brought and carried alongside the fronts.

Thus, any shore station on the Gulf's Arabian Coast, and its airport, of course, may, during the winter months, successively be affected, from the NW to the SE of the Gulf, by this very special type of haze. The haze, which sometimes intensifies rather strongly toward the end of the night, can bring about the formation of a characterized coastal fog, from the early hours of the morning, with a maximal density generally observed immediately after sunrise.

1.3.3. Thermal turbulence

For aviation, if we exclude the severe turbulence phenomena (with a substantial risk of being hit by lightning during flight) that may occur within zones of intense thunder-storms and quite particularly upon the passage of squall lines (cold fronts), turbulence of thermal origin is involved in the great majority of cases encountered over these regions where this type of weather circumstance is especially liable to develop.

In fact, thermal turbulence results from the convective

instability process initially triggered at the level of the low layers, which are overheated during the hottest months.

From May to October, a slight turbulence, at times intensified, always shows up late in the morning, with a maximum peak during the afternoon (from 1 to 4 P.M. local time), and until early evening, above the land.
Depending on insolation intensity (July-August), this thermal turbulence may increase and develop at the level of the middle layers, sometimes exceeding 12,000 feet in altitude.

When occurring suddenly, this type of turbulence may affect the piloting of airplanes, not only during the landing or taking-off process but also during the approach or climbing phase.

So, even though the least favorable conditions of horizontal and oblique visibility and visibility ceiling are observed mainly around the time of sunrise, one must recognize that this remains the period of the day during which the general weather conditions liable to affect flight have the least risk of being very stressful, even dangerous at times, during the carrying-out of the operational phases listed above.

1.3.4. Very high daytime summer temperatures

From mid-November to mid-March, temperatures are fairly average as a whole and very favorably appreciated by Europeans; sometimes, they even prove to be cool in the morning, following the passage of a NW frontal system.

But, from April, as the stabilizing marine influence of the Gulf over these regions remains rather insignificant -with the exception, however, of a very narrow coastal fringe- the temperatures are going to increase very rapidly, from week to week, and reach quite uncommon monthly maximums during July and August.

With the triple purpose of comparing:

a) the very high values of maximal daily temperatures (about 2:00 P.M. local time) in the hottest months of the year (July/August),

b) the absolute maximum reached on each airport considered,

c) the important temperature deviation between the winter average of maximal daily temperatures (January) and the average of maximal daily temperatures for the 2 hottest months of the year (July-August),

we cite, as a highly significant example, the values concerning the 6 airports dealt with in this study, as follows:

Temperatures in °C

AIRPORTS	JANUARY (1)	JULY (1)	AUGUST (1)	ABSOLUTE MAXIMUM reached (2)
BAHRAIN	20.0	37.2	37.8	45.0 (August)
ABU DHABI	23.9	39.8	40.6	47.4 (July)
DUBAI	23.3	37.8	39.5	47.8 (August)
DOHA	20.6	41.7	42.2	48.9 (August)
KUWAIT	18.5	44.8	44.7	49.8 (June)
DHAHRAN	21.7	43.4	42.8	50.1 (July)

(1) : Monthly average of maximal daily temperatures (around 2:00 P.M. local time).

(2) : Classification following the order of increase of the absolute maximal values reached.

According to the same statistical readings and always for the sake of comparison, we give the corresponding temperatures for NICE and BEIRUT:

AIRPORTS	JANUARY	JULY	AUGUST	ABSOLUTE MAXIMUM reached
NICE	12.6	26.3	26.1	35.8 (August)
BEIRUT	17.6	29.0	29.9	34.5 (May)

An examination of these two tables makes it possible to state:

1 - that, on the whole, the daytime summer temperatures of the Gulf's airports are from 10 to 15°C higher, compared to those usually prevailing at most airports along the Mediterranean.

2 - that, out of the 6 Gulf airports considered in this study, only the BAHRAIN airport has the benefit of relatively more moderate temperatures.

This is due to the controlling effect of the marine

environment, as the airport is located on Muharraq Island, itself about 40 kilometers distant from the Coast of Arabia.

3 - that the DHAHRAN airport, located on the Arabian Peninsula, yet still close to the coast and, in addition, less than 50 km from BAHRAIN, registers important differences of temperature with the latter, in the order of + 5 to + 6° C, which obviously shows how little influence may be exerted on the lands by the marine climate of the Persian Gulf, beyond a narrow coastal fringe.

4 - that, if we compare the temperatures of two airports considered as being located, relatively, at each of the Gulf's extremities, and yet separated by almost 5° in latitude, or in this case: KUWAIT in 29°15'N, and ABU DHABI in 24°25'N, we note that:

KUWAIT, at the NW of the Gulf records temperature averages in July/August ranging from 4 to 5° C higher than at ABU DHABI, an airport nevertheless located much further south than KUWAIT.

Such a difference, with the undeniable advantage of less excessive temperatures over the ABU DHABI airport, is due to the opposite effects of prevailing wind fluxes:

a) on KUWAIT; action of NW fluxes: the latter's surface winds, upon arrival over KUWAIT often bring their high temperatures to the airport after passing through the desert regions of southern Iraq.

b) on ABU DHABI: action of NW fluxes also, always predominant and reinforced during the hottest hours of the afternoon by a gulf breeze, at times rather strong.

These NW fluxes, however, have become gradually more humid and noticeably cooler, at least on the level of the very low layers, during their course alongside the Gulf. They reach the town and its airport located on a former sand island (now linked to the continent) in the very first place, Abu Dhabi's quasi-insular position thus giving it the advantage of benefiting, in the best possible way, from the marine influence of the Gulf.

5 - that the geographical location of DUBAI, on the Gulf's south-eastern coast, exposes the town and its airport to the same advantages as those listed for ABU DHABI, with a position slightly further North, which explains the closely related temperatures for these two airports, to DUBAI's distinct advantage.

6 - that the averages of the maximal summer temperatures recorded at the DOHA airport, though it is located in lat. 25°15' N, turn out to be higher than at DUBAI and ABU DHABI.

This appreciable difference in temperatures originates from the airport's location relatively "downwind" in regard to NW fluxes, but above all from its exposure to the very hot, sometimes burning, occasional SE winds from the Dahna Desert (cyclonic circulation in the hot months, generated by the EP cell settled over southern Arabia from early Spring), whose effect is only comparatively diminished by a gulf breeze, from the ENE sector, occurring during the afternoon.

1.4. PREVAILLING REGIONAL WINDS IN THE GULF

1.4.1. The "SHAMAL"

It is a NW wind, very often associated with the migratory depressions originating from Mesopotamia.

Under this same general designation, there exist, in fact, several types of "Shamals", depending on the special and seasonal weather conditions.

The "Shamals" may, in effect, be violent ("Squally Shamals"), strong, average or lighter. They may also spread over the Gulf and its shores, but very particularly along the Arabian Coast, a course during which they develop most strongly, and this in all seasons, before their later gradual weakening toward the South-east of the Gulf.

However, they are most of the time liable to occur suddenly, in the winter season, accompanied by storms over the Gulf, or by thunder-storms, squall lines and storm showers. These poor weather conditions as a whole are themselves linked with the passage of a cold front, to the rear of a depression (LP cell) quickly going through the area (Cf. par. 1.3.1. : NW migratory depressions).

Following this passage, and then very rapidly, clear, dry and cooler weather sets in, with good general visibility conditions.

Regarding the evolution of local weather conditions, one must record as a frequently noted symptomatic fact that, when the NW disturbance gets close to an airport of the Gulf's Arabian Coast, the local barometric pressure, after noticeably dropping for one day or two as the phenomenon draws near, very definitely starts to "go up again", the very moment the worst weather is about to be unleashed forthwith over the airport in question and its surrounding area.

First type of "Shamals" : the winter "Squally Shamals". More specially in regard to the type of "Shamals" liable to affect aviation, i.e. those more precisely known in this region as "Squally Shamals", it is useful to specify that their rate of progress through the Persian Gulf is directly dependent on the speed of the NW disturbance itself, which may occur in daytime as well as nightly.

Most commonly, such a disturbance system will take between 24 and 48 hours to cross the Gulf along its main axis, from the Shatt-al-Arab region and the KUWAIT zone, up to the Pirate Coast and the Strait of Ormuz.

However, one must clearly state that, in the great majority of cases, these "Squally Shamals", initially from the north-west sector over the first half of the Gulf, will very noticeably turn to the WNW in the vicinity of the Strait of Ormuz. They will cross this strait itself, and, in the Gulf of Oman, they will then orient themselves

frankly to the west and follow the coast of Southern Iran and that of Baluchistan. They will later reach KARACHI, 24 to 36 hours after crossing the Strait of Ormuz.

One day or two days before their passage over a shore station, it is interesting to report among the warning signs of their approaching arrival:

- at first, a tendency for the barometer to fall,
- then a rise in temperature,
- with SE winds gradually turning to SW,
- associated with a regime of cloudiness evolving toward a lower ceiling, the clouds gradually becoming thicker and more numerous along the coasts.

Second type of "Shamals" : the summer "Shamals"

Their manifestations are the cause, on the one hand, of the intensified low pressures in Summer over the Sea of Oman and North-Western India, and, on the other hand, of a fairly important rise in the pressure field that stretches over Western Europe and the Mediterranean (continental and seasonal ridge of the oceanic anticyclone over the Azores).

According to the importance assumed by the difference in pressure fields between the two action centers involved, the summer shamals may be relatively light or, on the contrary, reach an extreme violence.

Unlike the "Shamals" of the first type, these are much more lasting and may disturb a region, sometimes for a whole

week. Slight at first, affecting the pattern of moderate to average winds, they gradually increase their strength, which becomes maximal, sometimes from the second day, but most often during the third day, now and then even during the fourth day of their activity. Later, they progressively weaken, thus reversing the process that had characterized the first stage of their action.

Most violent at times, they may trigger sand-storms, bringing with them sand and dust in suspension from distant desert regions.

On account of the persistence of these winds over the region affected by them, of the sand and dust particles they carry and keep in suspension in the low and middle layers, of the very peculiar hazy atmosphere (sand-haze) that will sometimes last for several days after the end of their activity, the operational conditions of general visibility will remain poor long enough, for aviation; this visibility may even be considerably reduced during the phenomenon's maximum activity phase.

However, one should specify that this type of Shamals, occurring from late May to mid-September (with a peak of maximal frequency in June-July) is almost never associated with thunder-storms or with sudden squall lines.

1.4.2. The "KAUS"

The populations of these coastal regions of the Gulf give the generic name of "KAUS" to winds from the south-east to east blowing over the Persian Gulf and coming from the Strait of Ormuz area.

During the summer months, these winds practically represent the natural acceleration process of sea-breezes, rather frequent over the Gulf, during the afternoon.

In this season, they are themselves fed by the substantial monsoon flux that has spread over the Arabian Sea from the low latitudes and is then in full activity, not far from the Gulf.

In fact, these "KAUS" winds, by prolonging its coastal branch, form a part of the monsoon current, initially from the SW, that "goes upward" during the Summer along the coasts of Somalia, then of Southern Arabia.

We have indeed seen (Cf. par. 1.3.2. "Winds and Sand-hazes) that, under the action of a LP zone settled from Spring over the Dahna Desert (Southern Arabia), the coastal branch of this monsoon current is then swept along into the cyclonic flux of this semi-permanent action center, and next deviated into the Gulf of Oman. The general configuration of the coasts of Oman and of Muscat greatly facilitates the continuation of the gyratory cyclonic flux and its penetration into the Persian Gulf through the fault of the Strait of Ormuz.

It is then obvious that, due to its intertropical oceanic origin, this type of flux will be expressed, over the Gulf, by the action of hot and damp winds that now and then cause cloudiness particularly along the coasts.

Though they are lighter and occur now and then during Winter, these winds generally precede the arrival of NW depressions; they frequently show themselves in this way, alternating with the latter, as well as with the shamals, which, as we have seen, are very often associated with NW depressions.

Their advection over a coastal region soon gives rise, and this more or less relatively, to the appearance of stratiform clouds, of a type of hot and moist weather progressively darkening along with a gradual fall of the barometer.

Sometimes, this relative worsening of weather conditions may itself cause slight rains, or, most often, drizzle only.

However, it must be made quite clear that these various disturbances make for a type of weather much milder and more moderate than the one following the often violent transit of the Squally Shamals.

1.4.3. The "SUHAILI"

This is a SW wind whose main characteristics remain very close to those of KAUS, at least so far as its course over the Gulf and its effects upon the coast are concerned.

In Winter, KAUS or SUHAILI, unlike the SHAMALS when they occur, increase progressively and reach their maximum strength toward the end of their activity period, when they may sometimes achieve storm intensity after having blown rather moderately, such as a strong sea-breeze, for at least 12 hours previously.

However, though this type of winds (Kaus or Suhaili), at the stage of a rather strong breeze, most often heralds the approach of a winter NW depression, the latter, sometimes, may be located very far from the observation point and continue on its path without having disturbed the locality. Kaus or Suhaili then weaken gradually without having reached a velocity sufficient to create a strong swell and without even causing a pattern of bad weather in the area of the observation point.

According to this same process, they may also, at times, progressively diminish along their path and disappear, without having given rise, even very relatively, to the various most likely effects of their passage, which we have mentioned above.

1.4.4. The "NASHI"

It is a winter wind from NE to ENE upon entering the Gulf. After progressively becoming organized over the littoral areas of the Sea of Oman (action of cyclonic fluxes from the LP cell positioned over the Ocean in this season, to the W of the Malabar Coast), this coastal wind then follows the shores of Baluchistan and Southern Iran and naturally gets into the Persian Gulf through the Strait of Ormuz.

It is a normal wind whose activity is later accelerated and reinforced due to its conjunction with the cold and continental anticyclonic fluxes, themselves fed permanently during the winter months by the important ridge of the continental Asian anticyclone, which in this season is positioned over the Iranian mountains.
This coastal wind, well particularized through its patterns, most often affects the places on the Iranian shore.

Sometimes, with the advent of a NW depression, there may be an intensification in the activity of these fluxes from NE to ENE.
At this point, the meeting of these very cool winds with the hotter and damper SE winds of the depression's warm front, on their arrival, may originate the formation of important masses of clouds and rainfalls on the mountain slope of the Iranian coast.

Also, about mid-Winter, these winds may now and then enter into conflict, over the Persian Gulf, with particularly developed NW disturbances and, consequently, intensify, over the nearest area of the Arabian coast and over the most exposed airports, a cloudiness already important in this season and in such circumstances.

1.4.5. Additional information about the passage of winter NW depressions over the Gulf

Many travelers to tropical areas who have lived for some time on the shores of the Persian Gulf and have had occasion to witness the passage of a winter NW depression over the Gulf, are led to voice the idea that, in the Persian Gulf, storms appear, then cross and recross its expanse laterally, first affecting the Iranian coast, next the coast of Arabia and again the Iranian coast, the phenomenon as a whole seemingly progressing in zig-zag fashion toward the south-east of the Gulf. This rather commonly held opinion is, it seems, due a priori to the widespread impression that tropical storms (1), with their well-marked and localized center, bring destruction or cause serious disturbances in a narrow zone, along the line of passage of the depression's central sector.

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(1) Tropical storm: a degenerating cyclone (or typhoon), having reached a certain decline on its curvilinear path toward higher latitudes, upon encountering continental lands. The term is conventionally applied to this type of weather phenomenon when the velocity of the winds active within its system registers at between 34 and 63 kt.

Now, unlike tropical storms, deep, winter NW-depressions in the Persian Gulf determine a zone of very bad weather along a line stretching laterally, described as being the trace on the ground of a cold front as well as its effects aloft, which may continue stretching and spreading over several hundred miles, while it keeps on moving.

Many a time, it has been noted that a highly developed squall line, going by inside the Persian Gulf, actually produces bad weather simultaneously on both coasts of the Gulf that face each other, with, nevertheless, a certain intensification on the Arabian side.

The misleading impression of "rebounding from one shore to the other" may also remain in the mind of local observers of these regions due to the low density of coastal autochtonous populations in villages and towns sometimes rather distant from one another.

So it is that a severe storm may seem to affect first of all BUSHIRE on the Iranian coast, then BAHRAIN on the Arabian coast, then KISH, then again the Arabian coast toward ABU DHABI, next reaching the LINGEH area, etc..., thus giving this misleading impression of "oscillation" from one shore to the other, as the phenomenon's troublesome manifestations seem to have repercussions, in turn, over all these towns laid out from one end to the other of the Gulf's coasts.

1.4.6. Tropical storms in the Sea of Oman

These tropical storms practically do not affect -at least not directly- the airports of the Gulf's Arabian coast.

At the most, they may be the cause of a relative and short-lived worsening of general weather conditions, inside the Persian Gulf.

THE PERSIAN GULF

AND ITS COASTAL AREAS

II - LOCAL METEOROLOGY SUMMARY

2.1. ARABIAN COAST AIRPORTS

*

1 - KUWAIT 4 - DOHA

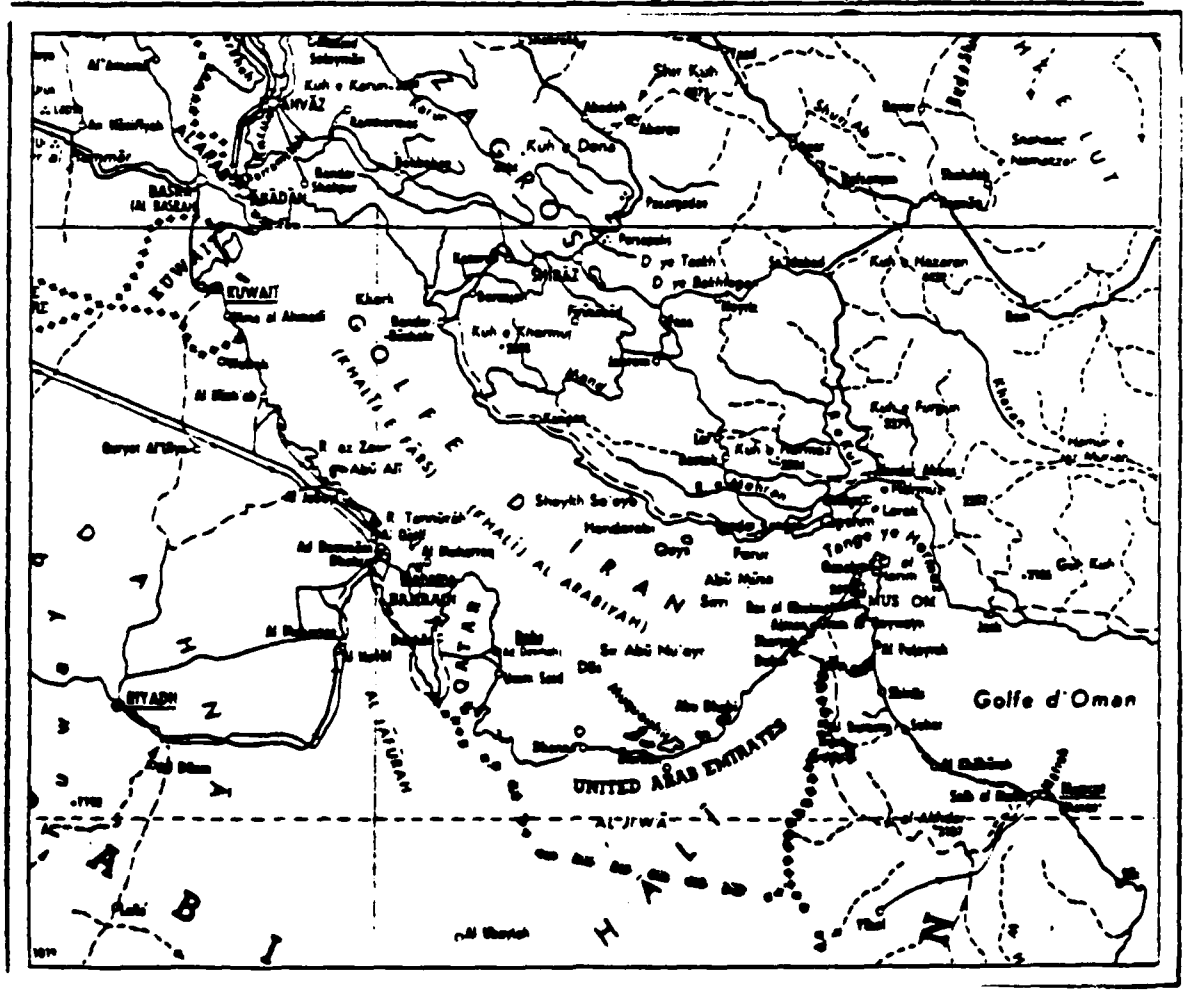
2 - DHAHRAN 5 - ABU DHABI

3 - BAHRAIN 6 - DUBAI

2.2 MONTHLY CLIMATOLOGICAL STATISTICS

2.3. HOURLY AVERAGES OF MONTHLY TEMPERATURES

The Persian Gulf and the chief airports of the Arabian coast



* Order according to position of airport on Arabian Coast considering the general NW-SE orientation of the Persian Gulf and the general tendency of the progression of depressions from NW through the Gulf.

1 - KUWAIT AIRPORT (Kuwait Emirate)

1.1. POSITION

Latitude: 29°13'N - Longitude: 47°59'E - Altitude: 56.4 m/185 ft.

1.2. LOCATION

KUWAIT Airport is located south of the Gulf of Kuwait, and at 16 km south of the town, on a very slight plateau. Its distance from the Persian Gulf is about twenty kilometers.

The KUWAIT emirate is located to the NE of the Arabian Peninsula and at the NW extremity of the Persian Gulf. It has common borders with Saudi Arabia to the West and with Iraq to the North.

The country is almost entirely made up of a flat desert with a very slight slope from W to East. It is dotted with a few oases, and, in parallel direction to the coast, with a succession of hills,including some small and low plateaus.

Nearly all the population lives in Kuwait City or along the coastal fringe.

1.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

1.3.1. WINTER (from November to Mid-March)

Prevailing NW winds - Strong influence of the HP located over Anatolia and Arabia. In this season, they determine over the KUWAIT area a flow of dry and cold continental polar air. The latter is the cause of the low winter temperatures, taking the region into account, especially toward the middle of this season: December and January.

During the 3 months that are even more clearly characteristic of the mid-winter period, December, January and February, the average monthly recordings are:

for NW winds: between 12 and 17 days;

for SE winds: about 7 to 8 days.

However, it should be noted that the highest wind velocities recorded during the Winter (and especially in December) correspond to SE winds (ESE to SSE), with a maximal speed average of 35 to 38 kt for this system of winds, a top speed of 50 to 55 kt being reached by some gusts.

Sand-winds and storms: This season is marked by the passage of deep migratory NW depressions over the region. These come from the Eastern Mediterranean by way of Mesopotamia or the Syrian Desert, most often with very strong winds (Squally Shamals).

SE winds prevail for about 3 to 4 days prior to the arrival of a depression and may give rise to wind activity, or even to a sand and/or dust storm, over Kuwait.

In addition, cold fronts are sometimes very active and also cause sand-winds. More exactly, sand-winds or sand-storms may occur within the developing flux of cold air that sometimes violently intervenes behind the cold front of a NW depression.

For the winter season, the averages, in number of days, appear as follows:

	Dec. Jan. - Feb. (1)	November to mid-March
Sand-storms	5 (2)	7 to 8
Sand-wind	9 (3)	14 to 15
Sand-haze	20 to 22 (4)	30 to 35

(1) these values correspond to very general periodic averages, provided as an indication.

(2) 9 days with sand-storms during the 3 months of the Winter 1964-65.

(3) 15 days with sand-winds during the 3 months of the Winter 1972-73

(4) 37 days with sand-haze during the 3 months of the Winter 1967-68.

General cloudiness: Dense haze and fog reach their maximum yearly frequency in December and January (between 6 and 8%) during the passage of NW depressions (warm front).

Besides, ceiling-visibility conditions, very limited at times, occur during the passage of a cold front liable to cause a rapid worsening of the weather: thunderstorms, squall lines, sand-storms, heavy showers...

1.3.2. SPRING TRANSITION (from mid-March to mid-May)

This transition period is marked by abrupt changes and/or variations in temperature: the days are already hot, the nights still cold at times.

On the other hand, the alternation of fluxes from the SE, then from the NW (the latter beginning to weaken progressively) represents a quasi-permanent factor of weather change, with sometimes considerable temperature deviations from one day to the next, of about + or - 15°C

for a same time block under consideration.

Rains (mostly in April) occur upon the passage of a NW depression, with a severe local thunderstorm (Sarrayat), this type of storm being rather frequent during this period (4 in April: monthly maximum for the year)

Days with sand-storms and sand-winds are already common enough in April (3 + 5) and especially in May (4 + 7).

1.3.3. SUMMER (from mid-May to mid-September)

First period: essentially June-July, very hot and dry semi-persistent winds from the NW: they sometimes reach such force that they create very severe sand-storms (5, per month) to which are added rather frequent sand-winds (8 to 9 per month).

Second period: from August to mid-September, fairly frequent very hot and humid SE winds, alternating with the prevailing NW winds.

During the whole summer period, there are very few important clouds but, often, sand-hazes that are rather lasting: on average 11 to 12 days per month, to which must be added, each month, 7 to 11 days of lighter sand-haze, in August and September.

Very high temperatures in July-August (maximum yearly peak in July).

- No precipitation occurs from mid-May to mid-September. The period of thunderstorms ends during the last two weeks in May.

1.3.4. AUTUMN TRANSITION (from mid-September to late October)

There is a rather noticeable decrease in the strength

of the winds which are also more variable, the strongest coming from the NW sector.

- Very definite decrease in sand-storms and sand-winds especially in October.

  Rather brief transition period during which general weather conditions improve markedly; two great climate regimens: that of Summer (LP systems and monsoon influence from the Oman Sea) declining rapidly; that of Winter hardly beginning to get organized.

- First, rare thunderstorms, sometimes, toward the end of October, with, only occasionally, the very first rains (very short and slight).
- Temperatures that are already noticeably more moderate.
- Very rare morning fogs (hardly 1 per month, on average)

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2 - DHAHRAN AIRPORT (Saudi Arabia)

2.1. POSITION

Latitude: 26°17'N - Longitude: 50°09'E - Altitude: 22 m/72 ft.

2.2. LOCATION

DHAHRAN Airport is located east of the Arabian Peninsula, on the Persian Gulf coast (Bahrain Island lies to the east, about 45 km away).

The surrounding area is an arid and sandy desert. It gently slopes up westward, reaching 100 ft about 200 km inland.

2.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

2.3.1. WINTER (from November to mid-March)

- More often than not, low to moderate cloudiness,

on the whole.

- Now and then, during the passage of NW depressions, chance of drizzle and fog (or stratus with low ceilings and more limited horizontal visibility), from the small hours to the middle of the morning.
- From November to mid-April, but mainly toward the end of the winter season (February-March), a few brief periods of very bad weather during the transit of active cold fronts: squall lines, thunderstorms, sand-winds or sand-storms, or, more moderately, drifting-and-blowing sand, and sand-hazes, the last lasting rather long at times.
- on average, 4 to 5 disturbances of this type involve the Dhahran region each month in Winter.
- This period sees a few, very occasional and short-lived intensifications of Siberian and Iranian HP, which bring about the rather sudden arrival of an EAST flux liable to last 4 to 5 days.
- Prevailing winds: WNW in November-December, progressively shifting to NW in January, then to NNW in February-March, just as they are about to become noticeably stronger (this is the worst period of the Winter).
- Precipitations : the very relative annual maximum is generally reached in December (with second relative maximum in March).
- Thunderstorms: the maximum monthly frequency for the year corresponds to the February-March period already reported above (5 thunderstorms per month, on average), with strong turbulence during their occurrence.

2.3.2. SPRING TRANSITION (from mid-March to mid-May)

- Starting with the last two weeks in March, general weather conditions begin to change rather quickly:
- Rains become scarcer; the very last and very minimal ones occur, very uncommonly, in late April or very early May, and, even so, do not always reach the ground, due to the intensified evaporation.

  Inside the peninsula, general humidity decreases very noticeably, again making possible any uplifting and transportation of sand and dust.
- Very occasional appearance (during April) of dry fog, in the morning and toward the middle of the day.
- Late in March, the last Mediterranean NW depressions are still going through the area, but the disturbances associated with the passage of the cold front have considerably weakened.
- Prevailing winds: from NNW to North. Maximal gain in strength in April (with February).

2.3.3. SUMMER (from mid-May to mid-September)

- As a result of the intense insolation and of the dry and sandy nature of the surrounding lands, sand-hazes develop almost every afternoon between May and August and last until midnight, to arise again from the time of sunrise.

  Now and then, in the afternoon, visibility may be reduced to 1500 meters, the worst time block being from the hours of 1:00 to 3:00 P.M. locally, with a definite improvement late in the afternoon, in June and July (each year the period of maximal sand-haze occurrence).

- Prevailing winds: from the NW, medium to rather strong, shifting to the NNW and north and getting slightly stronger during the day, under the moderate influence of gulf breezes.

  Occasionally, there may be very hot and desiccating land breezes, sometimes intensifying into sand-winds and sand-storms (especially during the June-July period, which corresponds to that of annual maximum insolation).
- Temperatures: very high at DHAHRAN, with the year's maximal peak in July (Cf. par. 1.3.4. "Very high daytime summer temperatures").
- Thermal turbulence: maximal in July-August, from 1:00 to 3:00 P.M. locally (Cf. par. 1.3.3. "Thermal turbulence").

2.3.4. AUTUMN TRANSITION (from mid-September to late October)

- General weakening of the various phenomena that occur during the long SUMMER period.
- Prevailing winds: from NNW in September, they will shift to the NW, then to WNW toward mid-October. More variable wind regimes: rather strong NW winds alternating with shorter periods of light winds.
- Alternating breezes from the Gulf and from the land.
- Improvement of general visibility conditions (chiefly in the afternoon, but occasional haze in the morning).
- Sand-wind frequency: rapid decrease starting with October (and especially from mid-October).
- Morning fogs: very infrequent. They lift off during the morning.

ATMOSPHERIC POLLUTION DUE TO INDUSTRIAL SMOKE

The only serious cause of atmospheric pollution here is due to smoke from the industrial petroleum-processing plants located about 5 km away, NW of the airport and at an altitude of 260 ft.

The natural gas reaching the surface is mixed with petroleum; after separation from the petroleum, it is burned as waste, giving off thick clouds of smoke.

This atmospheric pollution may happen over the airport at any time of the year, in stable air conditions with a light NW wind.

Though, on the whole, visibility is not overly affected by it, the smoke may sometimes succeed in forming an opaque layer between 500 and 1500 feet from the ground, in which in-flight visibility conditions are close to zero. Similar situations, just as stressful for aviation, may also occur more easily due to the previous existence of a persistent sand-haze in the lower layers, or in Winter when drizzle, fog or an important low stratus are already affecting the airport.

As a matter of fact, sand and dust particles in suspension, as well as these industrial smokes, form or spread in the atmosphere a considerable number of condensation nuclei; when the latter are carried by a light NW wind into the airport zone, the steam condensation phenomenon is made greatly easier.

Then, the rather rapid result is an intensification, important at times, of the cloudiness previously existing over the airport.

However, one must make it clear that, most of the time, the unfortunate effects of this type of pollution (industrial smoke) are limited to the hours between sunset and early morning, when the stability of the atmosphere in the lower layers has the greatest likelihood of being realized.

Some winter situations of extreme cloudiness over the airport, fortunately rather rare on the whole, nevertheless find their origin first of all in the passage of NW depressions bringing with them the usual very bad weather they carry along with them, then in the advection of low-layer atmospheric pollution during certain local conditions with stable to moderate wind. This increases even more and prolongs, over the airport, the pre-existing and already highly restrictive visibility/ceiling conditions that were affecting it.

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3 - BAHRAIN AIRPORT (Bahrain-Manama, Bahrain Emirate)

3.1 POSITION

Latitude: 26°16'N - Longitude: 50°37'E - Altitude: 2 m/7 ft.

3.2 LOCATION

The airport is located in the northern section of Muharraq Island, which itself lies to the NNE of the main island of Bahrain, and at some forty kilometers east of the Arabian Coast.
The emirate is composed of a 33-island archipelago located in a gulf, between the coast of Saudi Arabia and the Qatar Peninsula.

The north and especially the west coast of Bahrain Island make up a remarkably fertile region. This advantage, precious in such countries, results from: 1) the moderating effect of the surrounding

marine climate; 2) the utilization of a large number of underground springs; 3) the use of many irrigation canals. These combined advantages and their consequences (cultivation and vegetation zones determine a microclimate with successful stabilizing effects.

3.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

3.3.1. WINTER (from November to mid-March)

- Very little cloudiness, on the whole, even during the 3 months of mid-winter (December, January and February): about 2.5 % of observation cases, representing the rare periods of morning fog.
- Thunderstorms: 2 to 3 days of thunderstorms, on average and per month (better general conditions than at Dhahran, which is more affected by local thunderstorms during the passage of active cold fronts, more severe on the coast line). Strong turbulence.
- Prevailing winds: from the NW, getting progressively stronger until January and mid-February (Passage of NW depressions, with squall lines, sand-winds and sand-storms, less frequent than at Dhahran).
  Very occasionally, only after the passage of very active cold fronts: "squally shamals" activity (sand-storms or blowing-and-drifting sand)
- Maximal rains: chiefly during the first period of the winter: November-December; then, during the last period: February to early March.
- Hazes: in this winter period, any haze is associated with the passage of cold fronts accompanied by thunderstorms and equals. It is a mixture of locally uplifted haze and haze carried alongside the fronts.

3.3.2. SPRING TRANSITION (from mid-March to mid-May)

During March, the soil again turns drier and the dry fog becomes more frequent, though percentages are still low. It occurs only in the daytime, and rather rarely.

Prevailing winds: always and rather regularly from NW.

Good general visibility, aside from the periods of more frequent occurrence, from April, of sand-winds and sand-storms.

Last rains, very scanty, toward late April, very early May.

Some coastal stratus (or from the big island) may now and then evolve toward the airport in the morning until the hour before sunrise. However, they cause no really serious trouble in the great majority of cases.

3.3.3. SUMMER ~~(from mid-May to mid-September)~~

Very frequent sand-hazes in June and July, and particularly in June, when the worst time comes immediately following sunrise, with a noticeable improvement only in late afternoon.

Prevailing winds: from NW, varying in strength, almost continuous (15 to 20 kt), associated with the vast depression zone over India and the high plateau of Iran.

Generally fairly good visibility in August and September, during the afternoon and night, but rather frequent presence of haze in the morning.

Possibility of very hot and desiccating land breezes sometimes intensifying into sand-winds and sand-storms (especially in June-July, this period corresponding to that of annual maximal insolation).

- Thermal turbulence: maximal in July-August, from 1:00 to 4:00 P.M. local time (Cf. par. 1.3.3. "Thermal turbulence")

3.3.4. AUTUMN TRANSITION (from mid-September to late October)

From mid-September, more and more obvious return to a winter regime: short periods of strong NW winds alternating with brief periods of light winds.

During the first rains, toward the end of October, over nearby deserts, sandwind frequency is very quickly reduced.

Early morning fogs, rather rare, generally lift off before the end of the morning. More often, coastal fog banks or banks formed over the big island, may proceed toward the airport, in the shape of stratus, early in the morning and until the hour before sunrise. However, it is very rare that, during this transition period, such cloudiness may seriously affect the airport, as low ceilings of less than 100 ft remain the exception.

From mid-October: better general visibility conditions, especially during the afternoon.

Alternation of land breezes and breezes from the Gulf (well-marked, especially in October).

4 - DOHA AIRPORT (QATAR Emirate)

4.1. POSITION

Latitude: 25°16'N - Longitude: 51°34'E - Altitude: 10.7 m/35 ft.

4.2. SITUATION

The Doha airport is located a few kilometers from the town on the Qatar Peninsula, close to its eastern coast.

The interior of the peninsula is a half-desert marked by large sand-dunes. However, a substantial land development (superhighway and 800 km of excellent roads; an irrigation system currently in full expansion; recent construction of experimental farms; petroleum industry zones) has served to tone down - to a still relative degree for the time being - the excesses of a tropical climate which, in addition, is directly subjected to the influence of the Arabian Peninsula deserts close-by.

4.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

4.3.1 WINTER (from November to mid-March)

- Very little cloudiness, on the whole, even toward the middle of Winter. December, with 3 % of observed cases, represents the small monthly winter maximum, clearly ranking between Bahrain (with 2.6 %) and Dhahran (with 3.1 %).

  In January, 3 to 4 days with very strong winds, during the passage of cold fronts, with sand-winds or sand-storms (squally shamals) and a rough sea (strong swell in the Gulf).

  Maximal annual precipitations.

  In February: the most violent winds of the year. However,

the location of the airport quite relatively "leeward" of prevailing NW winds has the effect of noticeably diminishing the strength of these winds on the peninsula's eastern coast. In the great majority of observed cases, this results in wind velocities that are clearly more moderate than at Bahrain.

- Thunderstorms: their maximal occurrence for the year is reached in December (with an average of 4 thunderstorms during this month). January and February still represent a period for occasional bad weather, during the passage of NW cold fronts: thunder-showers associated with squall-lines, sand-winds and sand-storms, storms (3, on average, for each of these two months), strong swell in the Gulf...

Now and then, in a period alternating with the passage of NW depressions: winds from NE to East (Nashi); intensification of the gulf breeze, especially when a depression is approaching.

Noticeable improvement of general weather conditions in March.

4.3.2. SPRING TRANSITION (from mid-March to mid-May)

During the last two weeks in March, the general weather patterns begin to change noticeably.

The last Mediterranean NW depressions are still going by, at long intervals, but the disturbances associated with their active cold front are much lessened.

Nevertheless, the most marked seasonal transition of the year between the 2 opposite types of weather takes place during April: the rains become scarcer but will disappear (until November) only in early May, or a little later than at some other Gulf airports (with the exception of Bahrain, which,like Doha, benefits from a greater relative exposure to Gulf breezes). Consequently, dry fog shows up in May.

Good general visibility conditions, except during periods of sand-wind or sand-storm activity, more and more frequent in April and especially in May.

Thunderstorms become much scarcer (especially starting from the last 2 weeks of April).
Prevailing winds: from NW to North, fairly often with fluxes from ENE to SE.

4.3.3. SUMMER ~~(from mid-May to mid-September)~~

In June and July (particularly in June): intensification and persistence of sand-hazes, with the worst period immediately following sunrise (noticeable improvement only in late afternoon) and next between 1:00 and 3:00 P.M. local time.
Sand-winds and sand-storms: annual period of their peak monthly occurrence (22 in June; at least 16 in July).

In addition, a limitation of general visibility conditions also occurs due to the marine haze caused by a NE to ESE breeze (kaus oriented in this wind sector upon Qatar's eastern coast, which is directly exposed to the arrival

of monsoon fluxes from the Sea of Oman, by way of the Strait of Ormuz).

Fairly often, the result is a persistent haze, mixed in nature: marine + sand/dust lasting in the lower layers at times until nightfall.

Prevailing winds: always from N to NW but rather often active in a second sector: from NE to SE (these last winds are expressed by very hot and desiccating land-breeze pulses (mainly in June-July) that raise up sand-storms and sand-winds.

4.3.4. AUTUMN TRANSITION (from mid-September to late October)

During the last two weeks of September: rather variable type of weather: one still witnesses the transit of a few monsoon depressions from the Sea and Gulf of Oman, in short periods, already alternating with some stronger NW fluxes, announcing a return to the first NW depression passages. When these winds have sufficiently developed, they again create sand-winds and sand-storms, noticeably more numerous than in August, due to the extreme dryness of the ground and sand of the inner deserts.

In October, well-defined land and sea breezes. Now and then, abundant dew in the early morning.

Late October/early November: first rare thunderstorms of the early winter period.

During October: noticeable improvement in general visibility conditions (in comparison with September).

5 - ABU DHABI AIRPORT (Emirate of ABU DHABI) - UNITED ARAB EMIRATES

5.1. POSITION

Latitude: 24°25'N - Longitude: 54°28'E - Altitude: 4.6 m/15 ft.

5.2. LOCATION

The ABU DHABI airport, as well as the capital of this emirate, are located on a former sand island now linked to the continent. The shore line (formerly the Pirate Coast) largely closes up the Persian Gulf to the south-east, exposing the coastal towns to the prevailing NW winds that run over the Gulf, and also to the effects of breezes from the Gulf.

In the interior, the rocky hills of Al-Khatam represent the country's first orographic feature to the east, before the Ez Zahira and Djebel Hadjar ranges (3018 m).
The semi-arid ground, mostly covered by sand-dunes and dotted with oases and important new plantations at the cost of large-scale irrigation work, gradually rises toward the east where the above-mentioned mountain ranges, backbone of the Musandam Peninsula, form a relative natural protection against the monsoon fluxes from the Sea of Oman.

5.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

5.3.1. WINTER (from November to mid-March)

Rather little cloudiness, on the whole. A few rare cases of morning fog (with visibility below 1000 m), starting from November (2 mornings in November, on average).

However, one must report a definite intensification of the fog from early December: denser, more lasting fog

during the morning, as well as a higher average of monthly occurrences, as follows: December: 5 cases at least. (Worthy of note: December 1978, with 7 cases including 5 consecutive days during which the fog held up, only partially lifing off in the afternoon and building up again overnight and early in the morning).

January: about 4 cases, on average (another maximum to be reported: 7 cases in January 1978; 4 cases in January 1979, with 2 consecutive days). February: again 5 cases, at least, on average (worth recording: February 1979 with 9 cases for the month again including 5 consecutive days, 22nd through 26th, during which the banks of mixed fog held up, rising slightly as low stratus in the afternoon, organizing anew from the middle of the night and reaching maximal density in the morning twilight).

March: Rather obvious decrease in the frequency of occurrence, essentially during the last two weeks of the month; monthly average: about 3 cases , with at least 2 cases during the first fortnight (it is also useful to report the number of cases of fog recorded in March 1977: 5 cases, of which 4 during the first two weeks...).

Thunderstorms: clear decrease in the number of days with a thunderstorm or thunderstorms during the month in this SE zone of the Persian Gulf, as the migratory winter NW depressions are largely filled when they reach the back of the Gulf. The result is a very obvious weakening in the strength of the squally shamals and the passage of a squall line, almost turning into a monthly exception. On average: 1 day with thunderstorm(s) per month (in

March: 2 days).

Land and Gulf breezes: alternation of pronounced breezes.

1. Gulf breeze, from N to NW (with NNW axis), associated with and reinforced by the prevailing NW winds, during the day: mainly from 1:00 to 3:00 P.M. local time, a period when the speed of the Gulf breeze may reach 15 to 20 kt (most frequent case).
2. Land breeze: from SE to south (with SSE axis), now and then, and before the passage of an already much weakened NW depression.

Precipitations: very low at the start of the winter season. Most of the time, measurable rains occur only in early January and appreciably keep up through February. However, one must mention a few periods of exceptional dryness, even during those two months, which are considered as the two wettest months of the year: thus, the January-February 1979 period is numbered among these very dry spells (one single day with a rather short and scanty rain occurring over Abu Dhabi).

Most precipitations result from the passage of cold fronts (with low activity, as often as not); the cloudiness is then convective in nature.

Appreciable decrease in precipitations, from the first two weeks of March.

5.3.2. SPRING TRANSITION (from mid-March to mid-May)

Very rare and scanty rains, especially from mid-March to early April.

The first decade in April is marked by the annual periodic stoppage of precipitations (weak, rather brief, showers with a stormy cast, but,as often as not, without a thunderstorm pattern over the area: 1 or 2 per month, maximum).

Prevailing NW winds, associated to the Gulf breeze, in the afternoon.

Noticeable revival of sand-storm and sand-wind activity, particularly starting from May (5 + 3, during that month).

Now and then, mixed haze (sand, dust and industrial smoke) over the airport and surrounding area.

5.3.3. SUMMER (from mid-May to mid-September)

Very frequent mixed hazes in June-July-August (maximum annual peak in July with a total of 22 to 25 days of haze).

Intensification of sand-winds and sand-storms (4 sand-storms and 8 sand-winds on average, in July).

From June to August,(especially in June), the poor visility conditions are also caused by marine haze occurring along with a NE breeze (pulses of monsoon fluxes from the Sea of Oman).

Unlike the more restrictive but generally less durable winter fogs, these mediocre summer conditions may continue for many hours, even for several days, along the coasts, with sand or dust remaining in suspension in the atmosphere.

Prevailing NW winds: they become stronger in June, particularly on the Arabian coast (much lighter winds on

the Iranian coast).

Temperature and hygrometry: annual temperatures reach their maximum in August. As NW winds as well as the occasional NE winds are also very humid, the general weather conditions become oppressive and highly uncomfortable for Europeans.

5.3.4. AUTUMN TRANSITION (from mid-September to late October)

In the first two weeks of September, there are still a few incursions into the Gulf by monsoon depressions but, already, toward the end of the same month, the very first and rather light NW disturbances make their appearance in the NW and central zones of the Gulf. This translates into average weather at Abu Dhabi, with some roughness of the Gulf waters.

In October: more clear, or fairly clear, days.
Mixed haze in the morning and late in the evening.
Now and then,abundant dew after daybreak, some mornings.
Pronounced land and sea breezes.
Prevailing N to NW winds (with NNW axis)
Passage of more numerous and more developed NW disturbances (especially during the last two weeks of October).

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6 - DUBAI AIRPORT (DUBAI Emirate) - UNITED ARAB EMIRATES

6.1 POSITION

Latitude: 25°15'N - Longitude: 55°20'E - Altitude: 7.6 m/25 ft.

6.2 LOCATION

The DUBAI airport and the town close-by are located on the

coastal fringe of the Persian Gulf and on the banks of a natural water outlet forming a long inland estuary, the "Dubai Creek".

The general characteristics concerning the coast-line and the inland area correspond to the information stated for Abu Dhabi, namely:

Coast-line: the curvilinear orientation of the coast-line (SW-NE) largely closes up the Persian Gulf to the south-east. Full effect of the prevailing winds from the NW blowing over the Gulf,as well as of the Gulf breezes (particularly from the start to the middle of the afternoon).

Inland: the hills of Al-Khatam represent the country's first orographic feature to the east, before the ranges of Ez Zahira and Djebel Hadjar (3018 m).

The semi-arid ground, mostly composed of sand-dunes and dotted with oases and new plantations, gradually rises toward the east where the above-mentioned mountain ranges form a relative natural protection against monsoon fluxes from the Sea of Oman.

6.3. MAIN LOCAL SEASONAL WEATHER PATTERNS

6.3.1. WINTER (from November to mid-March)

Rather little cloudiness on the whole. A few rare cases of morning fog (with visibility below 1000 m), especially starting from the second decade in November:2 mornings, on average, in November; rather noticeable increase in December, however, with 4 or 5 mornings, on average; slight decrease in January with 3 or 4 mornings, but new increase in February with 4 to 5 mornings.

One should note that, as these intensified fogs are most of the time consecutive to the passage of winter depressions

from the NW, they occur very irregularly from one month to the next, but may at times persist for 2 or 3 days on end, lifting off slightly during the day and gathering up again after nightfall.

Likewise, it has been observed that, for a given winter month, cloudiness of this type occurred with very irregular frequency from one year to the next: thus, for instance, January: in 1977: 2 cases; in 1978, 6 cases; in 1979, 3 cases.

March: Rather noticeable decrease in the occurrence of cases, particularly during the last two weeks of the month: 2 cases on average, most often observed between March 1st and 20th.

Thunderstorms: rather noticeable decrease in the number of days per month with a thunderstorm or thunderstorms in this SE zone of the Persian Gulf, as the migratory winter NW depressions are largely filled when they reach the back of the Gulf. Consequently, as for ABU DHABI, the result is a very obvious weakening in the strength of the squally shamals and the passage of a squall line almost turning into a monthly exception: 1 day with thunderstorm(s) per month. Worth noting, however, is the stronger probability in December, then in March: 2 days with thunderstorm(s), on average, for each of these two months.

Gulf and land breezes: Alternation of pronounced breezes. Same general conditions as those specified for ABU DHABI, but with a noticeable strengthening of the winds, in regard to the Gulf breeze associated with the prevailing NW winds (NNW axis). This is due to the location of DUBAI more directly exposed to the arrival of these fluxes, appreciably within the Gulf's axis.

Precipitations: More often than not, they are very low in November. However, one must not for that entirely exclude the passage of a NW depression, especially during the last two weeks of November. Such a depression, after developing to an exceptional degree during its travel over the Gulf and passing north of the Qatar Peninsula without affecting it too much, will cross the coast-line in the vicinity of DUBAI, with a downpour over this area of very heavy storm-showers, upon the passage of squall-lines (Cf. table of monthly weather statistics about DUBAI: Absolute maximum of precipitation in 24 hours: 109.2 mm).

Yearly maximum in December, then a slight decrease each month until March, with a degree of constancy during the January-February period. However, as for ABU DHABI, one should mention a few periods of exceptional dryness, especially in January and February.

Most precipitations follow the passage of cold fronts (with low activity, as often as not); the cloudiness is then convective in nature.

Very important decrease in rain from mid-March.

6.3.2. SPRING TRANSITION (from mid-March to mid-May)

The rains are very scarce and very scanty from mid-March to early April.

The first decade of April is usually marked by the annual periodic stoppage of precipitations (brief showers with a stormy cast, as often as not, without a storm pattern over the area: hardly 1 thunderstorm per month).

Prevailing NW winds, associated with the Gulf breeze, which they reinforce during the afternoon.

Noticeable revival of sand-storm and sand-wind activity, particularly starting from MAY (4 + 2, during this month, more specially during the last two weeks).

Now and then, mixed haze (say: marine haze + sand-haze, dust, and haze from industrial and urban pollution)over the airport and the area extending from the town to the end of Dubai Creek, to the south.

6.3.3. SUMMER (from mid-May to mid-September)

Very frequent mixed hazes in June-July-August (maximum annual peak in July with, at least, 20 days of haze, an average of 22 to 24 days being recorded for this month).

Intensification of sand-winds and sand-storms, especially from June (6 sand-winds and 3 sand-storms, on average, in June). Yearly maximum reached in July with 7 sand-winds and 3 sand-storms (or high sand-winds).

A slight decrease in the frequency of occurrence and in the intensity of this type of phenomenon can already be noted during the month of August (more exactly, with the second fortnight).

From June to August (especially in June), the poor conditions of general visibility are also caused by marine haze occurring along with a NE breeze (pulses of monsoon fluxes from the Sea of Arabia due to the storms and depressions rather frequent in June-July over the whole ocean zone stretching from the Indian Peninsula to the Oman coast).

Unlike the more restrictive but less durable winter fogs , these poor summer conditions may continue for many hours, even for

days, along the coasts, with sand and dust remaining in suspension in the atmosphere.

Prevailing NW winds: they become stronger in June, particularly on the Arabian coast (much lighter winds on the Iranian coast). These winds, over the south-eastern zone of the Gulf, will, in fact, become NW trade-winds when they occur over the Arabian Sea.

Temperature and hygrometry: the annual temperatures reach their maximum in August. As the NW winds, and the occasional NE winds as well, are also very humid, the general weather conditions become oppressive and highly uncomfortable for Europeans.

6.3.4. AUTUMN TRANSITION (from mid-September to late October)

In the first two weeks of September, there are still a few incursions into the Gulf by monsoon depressions, but, already, toward the end of the same month, the very first and rather light NW disturbances make their appearance in the NW and central zones of the Gulf. This translates into average weather over DUBAI, with some roughness of the Gulf waters.

Toward the end of September, very occasionally, some larger NW disturbances may cause sand and dust-winds, even a severe sand-wind, over the Gulf and its south-eastern coast-line, with a rather dense sand-haze then lasting for 2 or 3 days in a row.

In October and early November: more clear, or rather clear, days.

Mixed haze: (marine haze + sand-haze and dust), in the morning and late in the evening.

On occasion, abundant dew after daybreak, some mornings.

N to NW winds (NNW axis): prevailing.

Passage of a greater number of more developed NW disturbances (especially during the last two weeks of October).

GENERAL REMARKS

An examination of the various local weather studies that have just been presented enables us to state that the general meteorological characteristics affecting the Persian Gulf each year may be divided, with noticeable alterations for each one, into three fairly distinct climate zones, namely:

1. NW Zone of the Gulf: KUWAIT region

   As to climate, this zone still remains rather like the neighboring areas of Lower Mesopotamia: very hot weather in Summer, rather high humidity along the shore-line (only) due to the nearness of the Shatt-al-Arab and huge marshes fed by the Tigris, the Euphrates and their tributaries in this low region, on the one hand, to the Persian Gulf on the other hand, and, finally, to the rather frequent passages of NW Mediterranean depressions, from November to April.

2. Central Zone of the Gulf: DHAHRAN, BAHRAIN and DOHA regions

   This zone does form the area most representative of climatological conditions closest to those of the Gulf, i.e. only more relatively influenced by the peripheral natural regions. This applies even more to the Bahrain and Doha areas, that of Dhahran being more directly exposed to the very hot and desiccating land-breezes from the deserts of the Arabian Peninsula, to the west.
   For Bahrain and Doha, one should also note the privileged location of the two airports (strong marine influence of the Gulf, leading to an appreciable stabilization of the main climatic factors pertaining to them).

3. SE Zone of the Gulf: ABU DHABI and DUBAI region

   Tropical zone on the one hand only more moderately influenced by NW depressions and, on the other hand, more directly exposed to:

a) the cyclonic fluxes from the semi-permanent LP zone located over the Dahna Desert (Southern Arabia); b) the intertropical influence of the very humid SW monsoon fluxes from the Arabian Sea (essentially from June to August), resulting in a NE flux after passing the Strait of Ormuz or the Musandam Peninsula, with an increase in Gulf breezes and, on occasion, in the rather persistent cloudiness over the shore areas (mixed haze).

THE PERSIAN GULF

AND ITS COAST LINES

II - SUMMARY

OF LOCAL METEOROLOGY

2.2. MONTHLY CLIMATOLOGICAL STATISTICS

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KUWAIT AIRPORT - Persian Gulf Emirate

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average	24.2	10.6	10.0	18.2	4.3	T	0	0	T	1.2	16.9	14.7	8.3
Max. in 24 h. (Absol. max.)	25.7	20.3	24.5	39.0	16.7	0.5	0	0	4	12.9	39.5	25.4	39.0
Days w/precip. ≥ 2.5mm (1)	3	2	2	2	1	1	0	0	1	1	2	2	14
Days with hail	-	1	-	1	1	-	-	-	-	-	-	-	3
Days with thunderstorm	1	1	2	4	3	0	0	0	0	1	2	1	15
WIND													
Prevailing wind direction *	NW	NW	NW	NW-SE	NW	NW	NW	NW	NW	NW	NW	NW	NW
Average speed (in kt)	9.0	9.6	9.7	9.6	9.6	11.2	10.6	9.1	7.6	7.4	7.0	7.8	9.2
Days with severe sand or dust-wind (2)	2	2	3	3	4	5	5	2	1	1	1	1	30
Days w/blowing & drifting sand (or dust)	3	4	6	5	7	9	8	3	4	2	2	2	59
TEMPERATURE (in °C)													
Monthly average	12.7	13.2	19.0	26.4	31.1	35.7	37.4	36.8	33.3	27.9	20.1	14.0	25.7
Daily MAXI. average (3)	18.5	20.7	26.1	31.3	36.3	41.4	44.8	44.7	41.4	36.5	26.9	20.0	32.5
Daily MINI. average (4)	7.9	9.3	13.9	18.3	22.7	27.1	30.8	30.1	26.2	19.5	13.8	8.5	18.6
Monthly MAXI. average (3)	24.5	27.5	34.2	39.5	44.7	48.8	47.8	47.5	45.1	40.3	33.4	26.4	36.1
Monthly MINI. average (4)	2.2	3.5	7.8	13.6	17.7	23.4	26.5	24.8	20.0	14.9	6.4	2.6	11.5
Absolute MAXIMUM (3)	29.8	32.6	41.2	44.2	49.0	49.8	49.2	49.0	46.1	43.2	38.0	30.5	49.8
Absolute MINIMUM (4)	-4.0	-1.1	3.3	9.7	15.0	20.4	23.7	20.6	16.8	11.3	0.7	-1.5	-4.0
RELATIVE HUMIDITY (in %)													
Monthly average	61	55	46	44	30	21	22	25	29	42	54	59	41
Daily MAXI. average (4)	69	66	59	56	47	33	35	39	41	46	57	65	50
Daily MINI. average,2-4 P.M.	38	31	25	22	15	8	9	10	12	14	21	26	21

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(*) or indication of 2 different wind regimes, with equal frequency.

(2) Duration of the phenomenon: 3 to 5 hours.

(3) Around 2 P.M., local time.

(4) Around the time of sunrise.

T : Traces

KUWAIT AIRPORT - Persian Gulf Emirate

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:			RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE										
00 - 03													
03 - 06	7.3	9.9	10.8	9.8	11.7	11.0	11.4	5.9	6.7	5.4	5.3	7.0	8.5
06 - 09													
09 - 12	4.3	4.8	3.7	3.9	3.0	4.1	3.6	2.6	1.0	1.1	1.8	1.6	3.3
12 - 15													
15 - 18													
18 - 21													
21 - 00													
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):			WITH LIMITING CONDITIONS OF SAND OR DUST HAZE										
00 - 03													
03 - 06	24.3	13.7	11.1	9.8	10.8	10.2	10.4	10.8	11.4	12.8	13.4	15.6	12.9
06 - 09													
09 - 12													
12 - 15	18.2	9.5	8.8	7.9	8.6	9.6	8.5	7.4	6.2	5.8	6.0	8.8	8.6
15 - 18													
18 - 21													
21 - 00													

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the case frequencies in % mentioned in Table A.

KUWAIT AIRPORT - Persian Gulf Emirate

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
GENERAL CLOUDINESS													
Average number of days per month (in 1. tenths) with:													
	10.3	7.5	5.2	5.3	3.3	3.3	3.7	3.2	10.8	11.7	12.5	11.3	92.1
. MEDIUM OR LIGHT HAZE	5.4	7.7	11.1	10.7	13.6	11.2	11.1	11.8	11.7	10.0	5.7	7.2	117.2
. SAND-HAZE													
. DENSE HAZE	4.7	3.2	1.7	1.4	0.3	0.1	0.4	0.8	1.4	2.9	2.8	5.0	24.7
. FOG	2.7	1.3	0.3	0.3	0.1	-	0.1	0.3	0.7	0.9	1.1	1.2	9.0
LIMITED OR RESTRICTED VISIBILITY													
A - Average number of days per month (incl. tenths) during which horizontal visibility was below:													
. 4000 meters	9.5	9.7	11.1	10.5	12.7	14.7	13.4	8.1	7.4	7.2	6.7	7.6	119.5
. 1000 meters (1)	3.7	2.5	4.7	3.8	4.3	5.3	5.7	3.6	1.4	2.0	1.6	2.7	42.3
. 600 meters	3.6	2.3	2.5	3.7	2.1	4.0	2.7	1.3	1.2	1.6	1.5	2.0	28.0
. 100 meters	2.3	0.7	0.8	1.6	0.5	0.3	0.3	0.3	0.4	0.8	0.7	1.2	10.2
B - Above values translated into an average number of hours per month (incl. tenths), for:													
. 4000 meters	30.8	56.5	58.9	44.5	25.3	68.1	76.9	42.1	24.7	21.3	26.2	29.7	523.5
. 1000 meters (1)	15.1	12.7	17.9	16.5	15.7	36.7	31.7	12.1	5.1	5.6	5.8	11.7	191.2
. 600 meters	17.6	7.9	5.0	10.4	7.7	18.5	21.7	4.6	3.8	4.0	4.7	8.4	112.0
. 100 meters	5.3	1.9	2.1	2.8	1.1	1.3	1.3	0.7	1.3	2.0	2.2	3.5	26.4

(1) All the monthly values shown are cumulated according to the increasing areas of horizontal visibility.

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average	6.6	7.6	12.7	2.0	0.0	0	0	0	0	0	8.1	16.8	4.4
Max. in 24 h. (Absol. max.)	22.4	22.9	41.0	5.0	4.6	0	0	0	0	T	41.9	24.1	41.9
Days w/precip. ≥ 2.5mm (1)	2	1	1		T	0	0	0	0	T	T	1	5
Days with hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Days with thunderstorm	3	4	6	3	1	0	0	0	0	0	2	3	22
WIND													
Prevailing wind direction *	NW	NNW	NNW	NNW	N	NNW	NNW	NNW	NNW	WNW	WNW	WNW	NNW
Average speed (in kt)	15.0	14.5	17.0	14.9	17.0	14.0	13.5	14.5	13.5	16.0	14.0	15.5	14.5
Days with severe sand or dust-wind (2)	1	3	2	6	6	16	12	3	6	3	2	1	60
Days w/blowing & drifting sand (or dust)	3	4	3	7	8	10	10	4	8	3	2	2	64
TEMPERATURE (in °C)													
Monthly average	16.1	16.7	20.0	25.0	31.1	36.1	36.1	35.6	33.3	27.8	23.3	17.8	26.6
Daily MAXI. average (3)	21.7	22.3	26.1	31.1	38.4	41.7	43.4	42.8	41.7	34.4	28.9	22.8	32.2
Daily MINI. average (4)	10.6	11.7	14.4	18.9	23.9	30.9	30.7	30.5	25.0	21.1	17.8	13.3	20.7
Monthly MAXI. average (3)	26.7	26.9	33.0	38.9	43.4	44.4	46.1	46.1	43.4	40.6	33.9	28.3	37.8
Monthly MINI. average (4)	7.8	8.6	9.4	14.4	19.4	23.9	27.2	27.2	22.8	14.4	12.2	8.4	16.7
Absolute MAXIMUM (3)	26.7	33.3	37.8	46.1	47.8	48.4	50.1	47.8	46.7	44.5	36.1	30.0	50.1
Absolute MINIMUM (4)	1.1	2.2	7.2	11.1	15.0	21.1	26.7	24.4	21.1	14.4	10.0	5.5	1.1
RELATIVE HUMIDITY (in %)													
Monthly average	69	65	56	50	40	32	39	46	51	59	65	70	54
Daily MAXI. average (4)	94	92	89	87	74	74	72	91	89	92	94	97	88
Daily MINI. average,2-4 P.M.	31	31	21	15	10	6	10	11	9	14	17	29	17

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(2) Duration of the phenomenon: 3 to 5 hours.
(3) Around 2 P.M., local time.
(4) Around the time of sunrise.

T : Traces

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:						RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE							
00 - 03	0,6	0,8	0,9	0,2	0,6	1,7	1,8	0,1	1,2	0,3	0,7	1,0	1,0
03 - 06	1,6	1,2	0,9	0,6	1,9	[illegible]	[illegible]	1,3	2,4	1,0	1,5	2,3	2,0
06 - 09	2,4	2,0	1,2	1,0	1,1	[illegible]	3,4	1,9	3,7	1,2	1,9	3,1	2,7
09 - 12	1,0	1,7	1,1	2,1	2,6	[illegible]	2,2	0,8	0,0	0,0	1,0	0,6	1,6
12 - 15	0,9	2,0	2,2	2,0	3,0	4,0	4,0	0,8	0,3	0,0	0,3	0,1	1,9
15 - 18	0,6	1,2	1,2	2,4	2,7	4,1	1,7	0,2	0,1	0,0	0,0	0,3	1,3
18 - 21	0,9	0,9	1,0	0,7	1,7	3,4	0,6	0,2	0,0	0,0	0,1	0,2	0,8
21 - 00	0,0	0,5	0,8	0,4	0,4	2,4	0,5	0,0	0,1	0,0	0,2	0,0	0,4
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):						WITH LIMITING CONDITIONS OF SAND OR DUST HAZE							
00 - 03	2,9	1,7	2,7	2,0	3,5	[illegible]	11,3	5,6	5,0	0,6	1,6	1,6	4,5
03 - 06	2,9	2,6	3,1	1,2	4,6	[illegible]	14,0	7,7	9,9	2,0	2,6	4,5	6,3
06 - 09	4,9	4,1	4,9	4,4	7,2	[illegible]	14,3	11,4	13,3	2,7	3,8	5,8	8,7
09 - 12	5,2	6,6	6,3	6,0	12,4	[illegible]	15,5	10,2	6,8	0,5	3,6	3,7	8,1
12 - 15	4,1	7,1	6,8	7,0	11,3	17,3	16,5	8,5	3,3	0,0	2,7	3,7	7,4
15 - 18	3,0	5,4	5,2	5,1	8,9	[illegible]	[illegible]	4,9	1,6	0,1	1,1	2,2	5,2
18 - 21	1,3	3,7	3,1	3,0	5,0	[illegible]	10,0	4,3	1,7	0,0	0,8	1,2	3,5
21 - 00	1,7	2,6	1,9	1,7	3,7	10,6	7,7	4,0	2,2	0,0	0,7	0,4	3,0

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the case frequencies in % mentioned in Table A.

BAHRAIN AIRPORT - Bahrain Emirate

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average	7.6	17.8	17.7	7.6	2.5	0	0	0	0	0	17.8	17.8	7.0
Max. in 24 h. (Absol. max.)	30.5	33.0	29.4	38.1	5.1	0	0	0	0	0	71.1	63.2	71.1
Days w/precip. ≥ 2.5mm (1)	2	1	1	2	T	0	0	0	0	0	2	4	16
Days with hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Days with thunderstorm	2	3	3	2	1	0	0	0	0	1	2	2	16
WIND													
Prevailing wind direction *	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW
Average speed (in kt)	19.5	19.0	18.0	18.5	18.0	20.0	18.5	15.5	16.0	17.5	18.0	18.5	18.2
Days with severe sand or dust-wind (2)	-	2	1	3	5	15	10	3	5	3	2	1	50
Days w/blowing & drifting sand (or dust)	1	3	2	6	7	8	7	4	7	5	2	1	51
TEMPERATURE (in °C)													
Monthly average	17.0	18.0	20.6	25.0	29.5	31.7	33.3	33.6	31.4	28.1	24.2	17.5	25.8
Daily MAXI. average (3)	20.0	21.1	23.9	29.9	33.3	35.6	37.2	37.8	35.6	32.2	27.8	21.7	29.9
Daily MINI. average (4)	13.9	15.0	17.2	21.1	25.6	27.8	29.4	29.4	27.2	23.9	20.6	15.6	22.2
Monthly MAXI. average (3)	26.1	28.9	31.7	36.7	39.5	40.0	42.2	42.2	40.0	36.1	32.8	27.8	35.3
Monthly MINI. average (4)	8.9	10.6	12.2	16.1	21.1	23.9	26.1	26.1	23.3	20.6	16.7	11.7	18.1
Absolute MAXIMUM (3)	29.4	30.4	35.0	40.6	42.2	43.9	44.4	45.0	44.4	39.5	36.1	31.1	45.0
Absolute MINIMUM (4)	5.0	7.2	10.6	13.3	18.9	21.1	23.9	23.7	21.7	18.9	14.4	8.9	5.0
RELATIVE HUMIDITY (in %)													
Monthly average	78	77	75	71	67	67	68	70	70	68	75	81	72
Daily MAXI. average (4)	85	85	80	75	71	69	69	74	73	80	80	85	77
Daily MINI. average,2-4 P.M.	71	70	70	66	63	64	67	69	64	56	70	77	68

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(2) Duration of the phenomenon: 3 to 5 hours.

(3) Around 2 P.M., local time.

(4) Around the time of sunrise.

T : Traces

BAHRAIN AIRPORT - Bahrain Emirate

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:					RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE								
00 - 03													
03 - 06	2.6	2.3	1.0	1.4	1.0	2.4	3.6	2.6	2.0	1.2	1.8	3.6	2.1
06 - 09													
09 - 12													
12 - 15	0.6	1.1	1.2	1.8	2.3	2.4	1.9	0.8	0.2	0.1	0.1	0.2	1.1
15 - 18													
18 - 21													
21 - 00													
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):					WITH LIMITING CONDITIONS OF SAND OR DUST HAZE								
00 - 03													
03 - 06	4.8	3.6	4.2	3.5	4.1	13.6	27.0	15.9	7.0	3.6	2.3	4.6	8.1
06 - 09													
09 - 12													
12 - 15	2.9	4.3	1.9	2.7	4.2	7.2	33.0	9.6	4.2	1.6	1.2	2.1	6.2
15 - 18													
18 - 21													
21 - 00													

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the case frequencies in % mentioned in Table A.

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average	18.7	15.0	10.2	4.0	1.3	0	0	0	0	0	6.1	21.8	77.5
Max. in 24 h. (Absol. max.)	42.5	22.5	17.3	13.8	6.2	0	0	0	0	0	28.4	19.2	42.5
Days w/precip. ≥ 2.5mm (1)	3	2	2	1	1	0	0	0	0	0	2	3	14
Days with hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Days with thunderstorm	2	1	2	1	1	0	0	0	0	1	2	3	13
WIND													
Prevailing wind direction *	NW/N & NE/SE	NW/N & ENE/SE	NW/N & ENE/SE	NW/N & ENE/SE	NW/N & NE/SE	NW/N & ENE/SE	NW/N & ENE/SE	NW/N & ENE/SE	NW/N & ENE/SE	NW/N & NE/E	NW/N & NE/E	NW/N & NE/E	W/NW & N & NE & SE
Average speed (in kt)	17	18	16	15	14	12	13	12	12	13	14	15	14.7
Days with severe sand or dust-wind (2)	1	3	2	4	5	12	8	3	5	2	1	1	47
Days w/blowing & drifting sand (or dust)	3	4	3	4	7	10	8	6	7	3	2	3	60
TEMPERATURE (in °C)													
Monthly average	16.4	17.8	21.1	26.4	31.1	34.7	35.9	35.8	33.1	28.9	23.3	18.4	27.0
Daily MAXI. average (3)	20.8	22.2	26.1	32.2	37.2	41.1	41.7	42.2	39.5	33.0	28.1	22.8	32.2
Daily MINI. average (4)	12.2	13.3	16.1	20.6	25.0	28.3	30.0	29.4	26.7	22.8	18.1	13.9	21.4
Monthly MAXI. average (3)	28.9	29.6	33.5	38.8	43.5	45.2	45.9	46.7	44.3	39.1	34.3	27.9	38.0
Monthly MINI. average (4)	7.9	9.6	11.2	15.6	20.7	23.6	27.6	27.3	23.6	19.7	13.1	9.6	17.4
Absolute MAXIMUM (3)	30.0	33.1	37.2	42.2	46.1	47.3	47.9	48.9	46.7	41.1	37.2	30.0	48.9
Absolute MINIMUM (4)	4.4	6.7	7.2	11.1	17.2	19.4	23.6	23.6	20.1	17.2	8.9	5.0	4.4
RELATIVE HUMIDITY (in %)													
Monthly average	73	73	69	65	62	59	58	62	63	69	70	74	66
Daily MAXI. average (4)	88	87	84	81	78	76	68	76	82	85	85	89	81
Daily MINI. average, 2-4 P.M.	62	59	54	49	46	44	48	48	46	40	53	59	51

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(2) Duration of the phenomenon: 3 to 5 hours

(3) Around 2 P.M., local time.

(4) Around the time of sunrise. T : Traces

(5) Occasional SW winds (land breezes), very hot and desiccating, at times very strong: sand-winds.

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:					RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE								
00 - 03													
03 - 06	2.2	2.6	1.2	1.6	1.5	7.0	1.8	2.6	1.2	1.3	2.0	2.0	2.7
06 - 09													
09 - 12													
12 - 15	0.3	1.2	1.3	2.2	2.6	6.3	2.0	0.4	0.2	0.1	0.0	0.3	1.1
15 - 18													
18 - 21													
21 - 00													
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):					WITH LIMITING CONDITIONS OF SAND OR DUST HAZE								
00 - 03													
03 - 06	4.3	5.8	5.0	6.2	7.6	21.6	16.8	11.8	11.4	4.2	4.0	5.4	8.6
06 - 09													
09 - 12													
12 - 15	2.4	3.2	3.7	4.8	2.0	11.3	12.0	7.8	4.2	2.4	1.8	2.0	5.6
15 - 18													
18 - 21													
21 - 00													

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the time frequencies in % mentioned in Table A.

ABU DHABI AIRPORT - Abu Dhabi Emirate - United Arab Emirates

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average	29.0	26.0	19.0	11.0	0	0	0	0	0	0	1.0	6.0	7.7
Max. in 24 h. (Absol. max.)	27.8	44.1	26.0	11.8	0	0	0	0	0	0	32.4	6.5	32.4
Days w/precip. ≥ 2.5mm (1)	2	T	1	1	0	0	0	0	0	0	T	1	7
Days with hail	0	0	0	0	0	0	0	0	0	0	0	0	0
Days with thunderstorm	1	1	2	1	1	0	0	0	0	0	0	1	7
WIND													
Prevailing wind direction *	NW-N	NW	NW	NW	NW	NW-N	N-NW	N-NW	N-NW	N-NW	N-NW	N-NW	NW-N
Average speed (in kt)	15	12	11	12	12	13	13	12	14	13	14	14	12
Days with severe sand or dust-wind (2)	1	2	1	2	3	4	4	1	2	1	1	1	23
Days w/blowing & drifting sand (or dust)	3	1	1	4	5	7	8	7	7	4	2	3	52
TEMPERATURE (in °C)													
Monthly average	19.0	19.8	23.5	28.8	31.0	32.9	34.4	35.0	33.1	29.0	24.9	20.8	27.5
Daily MAXI. average (3)	23.9	25.1	28.8	32.5	37.0	38.9	39.8	40.0	39.0	35.0	30.5	25.6	33.1
Daily MINI. average (4)	14.1	14.4	18.1	21.0	24.9	26.9	28.1	29.1	27.2	23.0	19.3	15.9	22.0
Monthly MAXI. average (3)	26.3	27.6	30.7	36.9	38.8	39.9	41.1	42.1	40.3	36.4	34.7	28.3	34.9
Monthly MINI. average (4)	11.7	12.6	15.8	20.3	23.5	25.7	27.6	28.6	25.7	21.6	17.9	14.0	20.5
Absolute MAXIMUM (3)	30.1	36.6	39.8	46.5	45.0	47.3	47.6	46.1	43.8	40.8	36.7	31.3	47.6
Absolute MINIMUM (4)	7.9	7.5	11.2	13.2	14.0	22.1	22.7	23.9	20.6	14.7	13.1	9.9	7.5
RELATIVE HUMIDITY (in %)													
Monthly average	68	63	62	57	53	57	60	60	61	62	64	67	61
Daily MAXI. average (4)	85	84	84	80	80	82	82	84	86	86	85	85	83
Daily MINI. average, 2-4 P.M.	50	41	40	34	27	32	38	36	35	38	43	48	38

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(2) Duration of the phenomenon: 3 to 5 hours.

(3) Around 2 P.M., local time.

(4) Around the time of sunrise.

T : Traces

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:						RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE							
00 - 03													
03 - 06													
06 - 09	2.6	2.8	1.1	1.6	1.3	1.0	0.0	0.2	0.7	1.2	2.0	1.0	1.1
09 - 12													
12 - 15													
15 - 18	0.4	0.6	0.4	0.5	0.7	1.0	1.7	0.6	0.6	0.2	0.7	0.4	0.6
18 - 21													
21 - 00													
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):						WITH LIMITING CONDITIONS OF SAND OR DUST HAZE							
00 - 03													
03 - 06													
06 - 09	4.2	4.8	3.2	4.6	7.8	21.4	15.2	13.4	11.2	4.0	3.8	4.6	8.4
09 - 12													
12 - 15													
15 - 18	0.6	1.2	2.3	0.8	1.5	1.6	0.4	2.2	1.6	1.2	1.8	0.6	1.0
18 - 21													
21 - 00													

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the case frequencies in % mentioned in Table A.

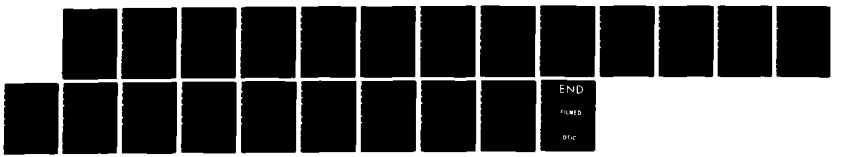
1. MONTHLY CLIMATOLOGICAL STATISTICS

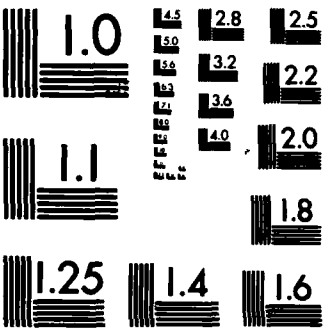
METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
GENERAL CLOUDINESS Average number of days per month (incl. tenths) with:	For Abu Dhabi, the indicated values correspond to the mean monthly number of days during which the specified meteorological phenomena have been observed each month over a period of 3 years. Until we get a greater number of other readings that may enable us at a later date to publish more precise values, the values mentioned below can only be provided as an indication.												
. MEDIUM OR LIGHT HAZE	10	9	10	7	10	12	11	14	13	10	9	9	134
. SAND-HAZE						*							
. DENSE HAZE													
. FOG	4	3	1	1	1	2	2	1	2	2	2	3	30
LIMITED OR RESTRICTED VISIBILITY													
A - Average number of days per month (incl. tenths) during which horizontal visibility was below:													
. 4000 meters													
. 1000 meters (1)													
. 600 meters													
. 100 meters													
B - Above values translated into an average number of hours per month (incl. tenths), for:													
. 4000 meters													
. 1000 meters (1)													
. 600 meters													
. 100 meters													

(1) All the monthly values shown are cumulated according to the increasing areas of horizontal visibility

* In July: 10 days

AD-A157 441 METEOROLOGY OF THE PERSIAN GULF AND OF SEVERAL AIRPORTS 2/2
ON THE ARABIAN COAST(U) FOREIGN TECHNOLOGY DIV
WRIGHT-PATTERSON AFB OH G MARCAL 12 JUN 85
UNCLASSIFIED FTD-ID(RS)T-0113-85 F/G 4/2 NL





MICROCOPY RESOLUTION TEST CHART

DUBAI AIRPORT - Dubai Emirate - United Arab Emirates

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
PRECIPITATIONS													
Monthly average													
Max. in 24 h. (Absol. max.)	22.9	22.9	10.2	5.1	0	0	0	0	0	0	10.2	33.6	8.9
Days w/precip. ≥ 2.5mm (1)	33.0	61.5	22.9	10.5	0	0	0	0	0	0	109.2	56.1	109.2
Days with hail	2	2	1	1	0	0	0	0	0	0	1	1	10
Days with thunderstorm	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	1	2	1	0	0	0	0	0	0	1	2	8
WIND													
Prevailing wind direction *													
Average speed (in kt)	NW	WNW	WNW	WNW	WNW	WNW	NW	NW	NW	NW	NW	NW	NW
Days with severe sand or dust-wind (2)	18	17	14	15	12	10	16	16	16	15	16	17	11.8
Days w/blowing & drifting sand (or dust)	1	1	1	2	2	3	3	2	1	1	1	0	18
	3	3	7	3	5	5	1	6	4	3	2	1	41
TEMPERATURE (in °C)													
Monthly average	17.8	18.9	21.1	24.1	28.1	30.6	33.8	33.6	31.1	27.5	24.1	20.0	25.9
Daily MAXI. average (3)	23.3	23.9	26.7	30.0	33.9	36.1	37.8	37.5	37.2	33.3	29.0	25.8	31.1
Daily MINI. average (4)	12.2	13.9	15.6	18.3	22.2	25.0	27.8	27.8	25.0	21.7	17.8	14.4	20.1
Monthly MAXI. average (3)	27.2	29.4	36.1	37.8	39.5	41.1	41.2	44.2	42.3	37.8	33.9	29.6	34.0
Monthly MINI. average (4)	7.8	10.0	10.6	13.3	18.3	21.1	21.2	24.4	22.3	18.9	14.4	11.1	16.1
Absolute MAXIMUM (3)	29.4	32.8	40.0	41.1	42.8	44.3	44.2	47.8	45.0	40.0	36.1	31.1	47.8
Absolute MINIMUM (4)	7.8	7.8	7.8	11.7	16.1	19.4	22.8	22.8	20.6	17.8	12.2	8.3	2.8
RELATIVE HUMIDITY (in %)													
Monthly average	71	72	69	65	62	64	64	65	67	69	69	72	67
Daily MAXI. average (4)	81	84	79	66	61	64	64	66	71	77	78	82	72
Daily MINI. average,2-4 P.M.	61	61	61	63	63	65	64	64	64	62	59	62	63

NOTE: All hour indications are to be understood in local time.

(1) Brief and light showers occurring during the passage of a front or depression, with less than 2.5 mm of rain, are not included in these statistics.

(2) Duration of the phenomenon: 3 to 5 hours.
(3) Around 2 P.M., local time
(4) Around the time of sunrise.

T : Traces

DUBAI AIRPORT - Dubai Emirate - United Arab Emirates

1. MONTHLY CLIMATOLOGICAL STATISTICS

METEOROLOGICAL ELEMENTS CONSIDERED	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
CLOUDINESS													
Restrictive conditions. Frequencies of cases, in percent, when conditions observed at the airport were:													
A - CEILING < 300 ft. and/or VISIBILITY < 1600 meters, during the following three-hour periods:						RESTRICTIVE CONDITIONS OF FOG OR DENSE HAZE							
00 - 03													
03 - 06	2.4	2.7	1.0	1.4	1.7	6.2	1.8	2.2	1.3	1.8	1.8	2.8	2.6
06 - 09													
09 - 12													
12 - 15	0.4	0.3	0.4	0.4	0.6	1.7	1.2	0.6	0.4	0.2	0.2	0.4	0.6
15 - 18													
18 - 21													
21 - 00													
B - CEILING < 1500 ft. and/or VISIBILITY < 4800 meters during the following three-hour periods (1):						WITH LIMITING CONDITIONS OF SAND OR DUST HAZE							
00 - 03													
03 - 06	4.2	4.6	4.7	4.2	5.8	18.8	11.2	11.6	9.4	3.8	3.6	4.5	7.4
06 - 09													
09 - 12													
12 - 15	0.5	1.0	1.9	0.7	1.4	3.2	2.8	2.0	1.2	1.0	1.4	0.6	1.7
15 - 18													
18 - 21													
21 - 00													

NOTE: All hour indications are to be understood in local time.
(1) Case frequencies in % from Table B include the case frequencies in % mentioned in Table A.

THE PERSIAN GULF

AND ITS COAST-LINES

II - SUMMARY

OF LOCAL METEOROLOGY

2.2. HOURLY AVERAGES OF MONTHLY TEMPERATURES

KUWAIT AIRPORT - Kuwait Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 11.7	+ 13.1	+ 17.4	+ 21.9	+ 27.3	+ 31.2	+ 32.8	+ 32.7	+ 29.0	+ 24.5	+ 18.1	+ 12.6
	85 % (2)	+ 15.6	+ 17.4	+ 21.6	+ 25.5	+ 30.6	+ 33.4	+ 34.5	+ 34.7	+ 31.1	+ 27.2	+ 21.9	+ 16.0
01	50 %	+ 10.9	+ 12.1	+ 16.3	+ 20.9	+ 26.2	+ 29.9	+ 31.5	+ 31.4	+ 27.6	+ 23.0	+ 17.0	+ 11.7
	85 %	+ 14.8	+ 16.4	+ 20.5	+ 24.5	+ 29.5	+ 32.1	+ 33.2	+ 33.4	+ 29.7	+ 25.7	+ 20.8	+ 15.1
02	50 %	+ 10.0	+ 11.4	+ 15.4	+ 19.8	+ 25.0	+ 28.6	+ 30.2	+ 30.1	+ 26.3	+ 21.9	+ 16.2	+ 10.8
	85 %	+ 13.9	+ 15.7	+ 19.6	+ 23.4	+ 28.3	+ 30.8	+ 31.9	+ 32.1	+ 28.4	+ 24.6	+ 20.0	+ 14.3
03	50 %	+ 9.1	+ 10.4	+ 14.5	+ 19.1	+ 24.4	+ 27.9	+ 29.6	+ 29.1	+ 25.2	+ 20.8	+ 15.2	+ 10.0
	85 %	+ 13.3	+ 14.7	+ 18.7	+ 22.7	+ 27.7	+ 30.1	+ 31.1	+ 31.1	+ 27.3	+ 23.5	+ 19.0	+ 13.5
04	50 %	+ 8.6	+ 9.9	+ 14.0	+ 18.7	+ 24.0	+ 27.4	+ 29.1	+ 28.6	+ 24.7	+ 20.1	+ 14.5	+ 9.3
	85 %	+ 12.7	+ 14.1	+ 18.1	+ 22.3	+ 27.1	+ 29.6	+ 30.8	+ 30.6	+ 26.8	+ 22.8	+ 18.3	+ 12.9
05	50 %	+ 8.2	+ 9.5	+ 13.6	+ 18.4	+ 23.7	+ 27.1	+ 28.8	+ 28.3	+ 24.4	+ 19.7	+ 14.2	+ 8.8
	85 %	+ 12.4	+ 14.0	+ 17.9	+ 22.1	+ 27.1	+ 29.4	+ 30.6	+ 30.3	+ 26.5	+ 22.4	+ 18.1	+ 12.5
06	50 %	+ 8.0	+ 9.4	+ 13.5	+ 18.6	+ 24.1	+ 27.6	+ 29.2	+ 28.4	+ 24.5	+ 19.5	+ 14.0	+ 8.6
	85 %	+ 12.3	+ 14.0	+ 17.9	+ 22.4	+ 27.8	+ 30.0	+ 31.1	+ 30.5	+ 26.8	+ 22.2	+ 18.0	+ 12.4
07	50 %	+ 7.9	+ 9.5	+ 14.0	+ 19.1	+ 25.0	+ 29.1	+ 30.7	+ 29.4	+ 25.6	+ 20.1	+ 14.2	+ 8.5
	85 %	+ 12.2	+ 14.2	+ 18.5	+ 23.2	+ 28.6	+ 31.6	+ 32.7	+ 31.5	+ 27.7	+ 22.8	+ 18.3	+ 12.7

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

KUWAIT AIRPORT - Kuwait Emirate

3. **HOURLY AVERAGES OF MONTHLY TEMPERATURES**, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 8,4	+ 10,4	+ 15,4	+ 20,9	+ 27,1	+ 31,2	+ 32,8	+ 31,4	+ 27,6	+ 21,8	+ 15,2	+ 9,1
	85 % (2)	+ 12,7	+ 15,1	+ 20,0	+ 24,9	+ 31,0	+ 33,8	+ 34,9	+ 33,6	+ 29,8	+ 24,7	+ 19,4	+ 12,9
09	50 %	+ 9,9	+ 12,1	+ 17,4	+ 22,9	+ 29,6	+ 33,8	+ 35,4	+ 34,1	+ 30,6	+ 24,5	+ 17,0	+ 10,7
	85 %	+ 14,2	+ 16,8	+ 22,1	+ 27,0	+ 33,4	+ 36,5	+ 37,6	+ 36,4	+ 32,7	+ 27,3	+ 21,2	+ 14,5
10	50 %	+ 12,0	+ 14,4	+ 19,8	+ 25,4	+ 32,4	+ 36,9	+ 38,4	+ 37,2	+ 33,7	+ 27,5	+ 19,8	+ 13,0
	85 %	+ 16,3	+ 19,1	+ 24,6	+ 29,6	+ 36,3	+ 39,7	+ 41,7	+ 39,6	+ 36,1	+ 30,4	+ 23,8	+ 16,8
11	50 %	+ 14,4	+ 16,7	+ 22,2	+ 27,6	+ 34,6	+ 39,1	+ 41,0	+ 40,1	+ 36,6	+ 30,5	+ 22,1	+ 15,5
	85 %	+ 18,6	+ 21,4	+ 27,0	+ 31,9	+ 38,8	+ 42,2	+ 43,2	+ 42,6	+ 39,1	+ 33,5	+ 26,3	+ 19,1
12	50 %	+ 16,5	+ 18,8	+ 24,2	+ 29,5	+ 36,5	+ 41,4	+ 42,9	+ 42,5	+ 38,2	+ 33,1	+ 24,3	+ 17,8
	85 %	+ 20,7	+ 23,9	+ 29,0	+ 33,8	+ 40,6	+ 44,4	+ 45,4	+ 45,1	+ 40,8	+ 36,1	+ 28,5	+ 21,6
13	50 %	+ 18,0	+ 20,1	+ 25,5	+ 30,6	+ 37,6	+ 42,7	+ 44,4	+ 43,9	+ 40,5	+ 34,7	+ 25,9	+ 19,4
	85 %	+ 22,1	+ 24,7	+ 30,1	+ 34,9	+ 41,7	+ 45,8	+ 47,0	+ 46,6	+ 43,2	+ 37,8	+ 30,1	+ 23,2
14	50 %	+ 18,5	+ 20,7	+ 26,1	+ 31,2	+ 38,2	+ 43,4	+ 44,8	+ 44,7	+ 41,4	+ 35,5	+ 26,5	+ 20,0
	85 %	+ 22,5	+ 25,3	+ 30,9	+ 35,5	+ 42,3	+ 46,5	+ 47,6	+ 47,4	+ 44,1	+ 38,7	+ 30,7	+ 23,7
15	50 %	+ 18,4	+ 20,6	+ 26,0	+ 31,1	+ 38,1	+ 43,2	+ 44,6	+ 44,5	+ 41,2	+ 35,3	+ 26,4	+ 19,9
	85 %	+ 22,4	+ 25,1	+ 30,8	+ 35,4	+ 42,2	+ 46,3	+ 47,2	+ 47,2	+ 43,9	+ 38,5	+ 30,6	+ 23,6

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

KUWAIT AIRPORT - Kuwait Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 18.2	+ 20.4	+ 24.6	+ 30.6	+ 37.5	+ 42.6	+ 44.0	+ 41.9	+ 40.5	+ 34.9	+ 28.1	+ 19.6
	85 % (2)	+ 22.1	+ 24.9	+ 30.1	+ 34.9	+ 41.6	+ 45.7	+ 46.6	+ 46.6	+ 41.2	+ 38.1	+ 30.2	+ 23.2
17	50 %	+ 17.8	+ 19.9	+ 25.1	+ 30.0	+ 36.7	+ 41.2	+ 41.2	+ 41.2	+ 39.9	+ 34.2	+ 25.6	+ 19.2
	85 %	+ 21.7	+ 24.3	+ 29.7	+ 34.2	+ 40.7	+ 44.7	+ 45.7	+ 45.8	+ 42.5	+ 37.3	+ 29.7	+ 22.7
18	50 %	+ 17.1	+ 19.1	+ 24.2	+ 29.1	+ 35.7	+ 40.6	+ 42.1	+ 42.0	+ 38.6	+ 33.1	+ 24.7	+ 18.5
	85 %	+ 21.0	+ 23.5	+ 28.8	+ 33.2	+ 39.6	+ 43.5	+ 44.5	+ 44.5	+ 41.1	+ 36.1	+ 28.7	+ 21.9
19	50 %	+ 16.4	+ 18.3	+ 23.1	+ 28.2	+ 34.6	+ 39.1	+ 40.8	+ 40.9	+ 37.4	+ 32.0	+ 23.8	+ 17.7
	85 %	+ 20.3	+ 22.6	+ 27.8	+ 32.2	+ 38.4	+ 42.1	+ 43.1	+ 43.1	+ 39.8	+ 34.9	+ 27.8	+ 21.1
20	50 %	+ 15.5	+ 17.4	+ 22.2	+ 26.9	+ 33.3	+ 37.9	+ 39.4	+ 39.2	+ 35.7	+ 30.5	+ 22.8	+ 16.8
	85 %	+ 19.4	+ 21.7	+ 26.6	+ 30.8	+ 37.0	+ 40.6	+ 41.6	+ 41.5	+ 38.0	+ 33.3	+ 26.7	+ 20.2
21	50 %	+ 14.7	+ 16.4	+ 21.1	+ 25.8	+ 31.7	+ 36.1	+ 37.6	+ 37.7	+ 34.2	+ 29.1	+ 21.7	+ 15.8
	85 %	+ 18.6	+ 20.7	+ 25.4	+ 29.6	+ 35.1	+ 38.7	+ 39.7	+ 39.8	+ 36.4	+ 31.8	+ 25.5	+ 19.2
22	50 %	+ 13.7	+ 15.3	+ 19.8	+ 24.4	+ 30.1	+ 34.3	+ 35.8	+ 35.9	+ 32.3	+ 27.5	+ 20.6	+ 14.8
	85 %	+ 17.6	+ 19.6	+ 24.0	+ 28.1	+ 33.6	+ 36.8	+ 37.8	+ 37.9	+ 34.4	+ 30.2	+ 24.4	+ 18.2
23	50 %	+ 12.7	+ 14.2	+ 18.5	+ 23.2	+ 28.8	+ 32.8	+ 34.4	+ 34.4	+ 30.7	+ 25.9	+ 19.3	+ 13.7
	85 %	+ 16.6	+ 18.5	+ 22.7	+ 26.8	+ 32.2	+ 35.2	+ 36.3	+ 36.4	+ 32.8	+ 28.6	+ 23.1	+ 17.1

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DHAHRAN AIRPORT - Saudi Arabia

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 14.6	+ 15.2	+ 18.0	+ 22.3	+ 27.5	+ 32.1	+ 33.0	+ 32.6	+ 30.1	+ 25.2	+ 21.5	+ 16.4
	85 % (2)	+ 17.0	+ 18.6	+ 21.2	+ 26.1	+ 29.7	+ 34.4	+ 34.5	+ 33.9	+ 31.5	+ 28.0	+ 24.0	+ 19.3
01	50 %	+ 13.7	+ 14.3	+ 16.9	+ 21.3	+ 26.4	+ 31.1	+ 31.8	+ 31.2	+ 28.7	+ 24.0	+ 20.6	+ 15.7
	85 %	+ 16.1	+ 17.7	+ 20.1	+ 25.1	+ 28.6	+ 33.4	+ 33.3	+ 32.7	+ 30.1	+ 26.8	+ 23.1	+ 18.6
02	50 %	+ 12.8	+ 13.6	+ 16.2	+ 20.4	+ 25.2	+ 30.1	+ 30.6	+ 30.0	+ 27.5	+ 23.1	+ 19.8	+ 15.0
	85 %	+ 15.2	+ 17.0	+ 19.4	+ 24.2	+ 27.4	+ 32.4	+ 32.1	+ 31.5	+ 28.9	+ 25.9	+ 22.3	+ 17.9
03	50 %	+ 12.0	+ 12.7	+ 15.3	+ 19.6	+ 24.6	+ 29.5	+ 29.8	+ 29.2	+ 26.3	+ 22.2	+ 18.9	+ 14.2
	85 %	+ 14.4	+ 16.1	+ 18.5	+ 23.4	+ 26.8	+ 31.8	+ 31.3	+ 30.7	+ 27.7	+ 25.0	+ 21.4	+ 17.1
04	50 %	+ 11.4	+ 12.2	+ 14.9	+ 19.3	+ 24.2	+ 29.2	+ 29.3	+ 28.7	+ 25.7	+ 21.6	+ 18.4	+ 13.8
	85 %	+ 13.8	+ 15.6	+ 18.1	+ 23.1	+ 26.4	+ 31.5	+ 30.8	+ 30.2	+ 27.1	+ 24.4	+ 20.9	+ 16.7
05	50 %	+ 10.9	+ 11.9	+ 14.5	+ 19.0	+ 23.9	+ 28.9	+ 29.0	+ 28.4	+ 25.1	+ 21.2	+ 18.0	+ 13.5
	85 %	+ 13.3	+ 15.3	+ 17.8	+ 22.9	+ 26.1	+ 31.2	+ 30.6	+ 29.9	+ 26.5	+ 24.0	+ 20.5	+ 16.4
06	50 %	+ 10.7	+ 11.8	+ 14.4	+ 19.1	+ 24.3	+ 29.3	+ 29.2	+ 28.6	+ 25.0	+ 21.1	+ 17.9	+ 13.4
	85 %	+ 13.2	+ 15.3	+ 17.8	+ 23.1	+ 26.6	+ 31.7	+ 30.8	+ 30.2	+ 26.5	+ 23.9	+ 20.4	+ 16.4
07	50 %	+ 10.6	+ 11.9	+ 14.9	+ 19.9	+ 25.2	+ 30.4	+ 30.1	+ 29.5	+ 25.7	+ 21.6	+ 18.0	+ 13.5
	85 %	+ 13.1	+ 15.5	+ 18.4	+ 24.0	+ 27.6	+ 32.9	+ 31.7	+ 31.1	+ 27.2	+ 24.5	+ 20.5	+ 16.5

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DHAHRAN AIRPORT - Saudi Arabia

3. **HOURLY AVERAGES OF MONTHLY TEMPERATURES**, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 11.2	+ 12.7	+ 16.2	+ 21.3	+ 27.3	+ 32.1	+ 31.8	+ 31.2	+ 27.3	+ 23.1	+ 18.9	+ 14.2
	85 % (2)	+ 13.8	+ 16.4	+ 19.8	+ 25.6	+ 30.0	+ 34.7	+ 33.3	+ 32.9	+ 29.1	+ 26.1	+ 21.3	+ 17.3
09	50 %	+ 12.7	+ 14.3	+ 18.0	+ 23.3	+ 29.8	+ 34.2	+ 34.1	+ 33.5	+ 30.2	+ 25.2	+ 20.6	+ 15.7
	85 %	+ 15.4	+ 18.1	+ 21.7	+ 27.7	+ 32.4	+ 36.9	+ 35.8	+ 35.2	+ 31.8	+ 28.3	+ 23.3	+ 18.8
10	50 %	+ 14.9	+ 16.4	+ 20.2	+ 25.6	+ 32.8	+ 36.8	+ 36.9	+ 36.3	+ 33.2	+ 27.7	+ 22.8	+ 17.6
	85 %	+ 17.7	+ 20.3	+ 24.0	+ 30.1	+ 35.3	+ 39.4	+ 38.6	+ 38.0	+ 35.0	+ 30.9	+ 25.6	+ 20.8
11	50 %	+ 17.6	+ 18.5	+ 22.5	+ 27.7	+ 34.8	+ 38.5	+ 39.3	+ 38.7	+ 36.5	+ 30.3	+ 25.0	+ 19.5
	85 %	+ 20.3	+ 22.5	+ 26.4	+ 32.3	+ 37.6	+ 41.4	+ 41.1	+ 40.5	+ 38.2	+ 33.6	+ 27.9	+ 22.7
12	50 %	+ 19.6	+ 20.4	+ 24.3	+ 29.5	+ 36.7	+ 40.2	+ 41.5	+ 40.9	+ 39.2	+ 32.6	+ 27.0	+ 21.2
	85 %	+ 22.5	+ 24.4	+ 28.3	+ 34.2	+ 39.6	+ 43.1	+ 43.3	+ 42.7	+ 41.0	+ 35.8	+ 30.0	+ 24.5
13	50 %	+ 21.1	+ 21.7	+ 25.5	+ 30.5	+ 37.8	+ 41.2	+ 42.8	+ 42.2	+ 40.9	+ 33.7	+ 28.2	+ 22.3
	85 %	+ 24.1	+ 25.7	+ 29.5	+ 35.2	+ 40.7	+ 44.1	+ 44.6	+ 44.0	+ 42.7	+ 37.2	+ 31.6	+ 25.7
14	50 %	+ 21.7	+ 22.2	+ 26.1	+ 31.1	+ 38.4	+ 41.7	+ 43.4	+ 42.8	+ 41.7	+ 34.6	+ 28.9	+ 22.8
	85 %	+ 24.7	+ 26.2	+ 30.1	+ 35.8	+ 41.3	+ 44.6	+ 45.2	+ 44.6	+ 43.5	+ 38.0	+ 32.0	+ 26.2
15	50 %	+ 21.6	+ 22.1	+ 26.0	+ 31.0	+ 38.3	+ 41.6	+ 43.1	+ 42.7	+ 41.5	+ 34.3	+ 28.8	+ 22.7
	85 %	+ 24.6	+ 26.1	+ 30.0	+ 35.7	+ 41.2	+ 44.5	+ 45.1	+ 44.5	+ 43.3	+ 37.9	+ 31.9	+ 26.1

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DHAHRAN AIRPORT - Saudi Arabia

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 21.4	+ 21.9	+ 25.6	+ 30.5	+ 37.7	+ 41.1	+ 42.7	+ 42.1	+ 41.0	+ 33.9	+ 28.6	+ 22.5
	85 % (2)	+ 24.4	+ 25.9	+ 29.8	+ 35.2	+ 40.6	+ 44.0	+ 44.5	+ 43.9	+ 42.7	+ 37.6	+ 31.6	+ 25.9
17	50 %	+ 20.9	+ 21.5	+ 25.2	+ 30.0	+ 36.9	+ 40.4	+ 42.1	+ 41.5	+ 40.4	+ 33.3	+ 28.1	+ 22.1
	85 %	+ 23.8	+ 25.4	+ 29.1	+ 34.6	+ 39.8	+ 43.3	+ 43.9	+ 43.3	+ 42.1	+ 36.7	+ 31.1	+ 25.5
18	50 %	+ 20.3	+ 20.7	+ 24.3	+ 29.1	+ 35.9	+ 39.5	+ 41.1	+ 40.5	+ 39.2	+ 32.4	+ 27.3	+ 21.5
	85 %	+ 23.1	+ 24.5	+ 28.1	+ 33.6	+ 38.7	+ 42.3	+ 42.9	+ 42.2	+ 40.8	+ 35.7	+ 30.2	+ 24.8
19	50 %	+ 19.5	+ 20.0	+ 23.5	+ 28.3	+ 34.8	+ 38.5	+ 40.1	+ 39.5	+ 38.0	+ 31.5	+ 26.6	+ 20.8
	85 %	+ 22.2	+ 23.7	+ 27.2	+ 32.7	+ 37.5	+ 41.2	+ 41.8	+ 41.2	+ 39.6	+ 34.7	+ 29.4	+ 24.0
20	50 %	+ 18.6	+ 19.2	+ 22.5	+ 27.1	+ 33.5	+ 37.4	+ 38.6	+ 38.0	+ 36.5	+ 30.3	+ 25.7	+ 20.0
	85 %	+ 21.2	+ 22.8	+ 26.1	+ 31.4	+ 36.1	+ 40.0	+ 40.3	+ 39.7	+ 38.0	+ 33.4	+ 28.4	+ 23.1
21	50 %	+ 17.7	+ 18.2	+ 21.4	+ 26.0	+ 31.9	+ 35.9	+ 37.3	+ 36.7	+ 35.0	+ 29.1	+ 24.7	+ 19.2
	85 %	+ 20.2	+ 21.7	+ 24.9	+ 30.2	+ 34.4	+ 38.4	+ 38.9	+ 38.3	+ 36.5	+ 32.1	+ 27.3	+ 22.2
22	50 %	+ 16.7	+ 17.3	+ 20.2	+ 24.6	+ 30.3	+ 34.5	+ 35.7	+ 35.1	+ 33.3	+ 27.7	+ 23.7	+ 18.3
	85 %	+ 19.1	+ 20.7	+ 23.6	+ 28.6	+ 32.7	+ 36.9	+ 37.3	+ 36.7	+ 34.7	+ 30.5	+ 26.2	+ 21.2
23	50 %	+ 15.6	+ 16.2	+ 19.1	+ 23.5	+ 29.0	+ 33.4	+ 34.4	+ 33.8	+ 31.7	+ 26.4	+ 22.6	+ 17.4
	85 %	+ 18.0	+ 19.6	+ 22.4	+ 27.4	+ 31.3	+ 35.7	+ 36.0	+ 35.4	+ 33.1	+ 29.2	+ 25.1	+ 20.2

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

BAHRAIN AIRPORT - Bahrain Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 16.1	+ 17.0	+ 19.3	+ 23.3	+ 27.5	+ 29.7	+ 31.6	+ 31.8	+ 29.8	+ 26.3	+ 23.0	+ 17.6
	85 % (2)	+ 17.1	+ 20.5	+ 22.2	+ 26.5	+ 30.1	+ 32.2	+ 33.7	+ 33.9	+ 32.2	+ 28.5	+ 25.4	+ 20.1
01	50 %	+ 15.6	+ 16.5	+ 18.7	+ 22.7	+ 26.9	+ 29.1	+ 31.0	+ 31.1	+ 29.0	+ 25.7	+ 22.4	+ 17.1
	85 %	+ 18.6	+ 20.0	+ 21.6	+ 25.9	+ 29.5	+ 31.6	+ 33.1	+ 33.2	+ 31.4	+ 27.7	+ 24.8	+ 19.8
02	50 %	+ 15.1	+ 16.1	+ 18.2	+ 22.0	+ 26.3	+ 28.5	+ 30.3	+ 30.4	+ 28.4	+ 25.1	+ 21.9	+ 16.7
	85 %	+ 18.1	+ 19.6	+ 21.1	+ 25.2	+ 28.9	+ 31.0	+ 32.4	+ 32.5	+ 30.8	+ 27.1	+ 24.3	+ 19.4
03	50 %	+ 14.7	+ 15.6	+ 17.7	+ 21.6	+ 26.0	+ 28.2	+ 29.9	+ 29.9	+ 27.9	+ 24.6	+ 21.3	+ 16.2
	85 %	+ 17.7	+ 19.1	+ 20.6	+ 24.8	+ 28.6	+ 30.7	+ 32.0	+ 32.0	+ 30.3	+ 26.6	+ 23.7	+ 18.9
04	50 %	+ 14.3	+ 15.3	+ 17.5	+ 21.3	+ 25.7	+ 27.9	+ 29.6	+ 29.7	+ 27.5	+ 24.2	+ 21.0	+ 15.9
	85 %	+ 17.3	+ 18.8	+ 20.4	+ 24.5	+ 28.3	+ 30.4	+ 31.7	+ 31.8	+ 29.9	+ 26.2	+ 23.4	+ 18.6
05	50 %	+ 14.1	+ 15.1	+ 17.3	+ 21.2	+ 25.6	+ 27.8	+ 29.5	+ 29.5	+ 27.3	+ 24.0	+ 20.7	+ 15.7
	85 %	+ 17.1	+ 18.6	+ 20.2	+ 24.4	+ 28.2	+ 30.3	+ 31.6	+ 31.6	+ 29.7	+ 26.0	+ 23.1	+ 18.4
06	50 %	+ 14.0	+ 15.1	+ 17.2	+ 21.3	+ 25.8	+ 28.0	+ 29.6	+ 29.6	+ 27.2	+ 23.9	+ 20.7	+ 15.7
	85 %	+ 17.0	+ 18.7	+ 20.2	+ 24.6	+ 28.5	+ 30.6	+ 31.8	+ 31.8	+ 29.6	+ 25.9	+ 23.1	+ 18.6
07	50 %	+ 13.9	+ 15.1	+ 17.3	+ 21.7	+ 26.3	+ 28.7	+ 30.0	+ 30.1	+ 27.5	+ 24.2	+ 20.7	+ 15.7
	85 %	+ 16.9	+ 18.7	+ 20.3	+ 25.0	+ 29.2	+ 31.1	+ 32.2	+ 32.3	+ 30.0	+ 26.3	+ 23.1	+ 18.6

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

BAHRAIN AIRPORT - Bahrain Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 14.2	+ 15.6	+ 18.2	+ 22.7	+ 27.5	+ 29.7	+ 31.0	+ 31.1	+ 28.4	+ 25.1	+ 21.1	+ 16.2
	85 % (2)	+ 17.3	+ 19.7	+ 21.1	+ 26.1	+ 30.1	+ 32.4	+ 33.2	+ 33.1	+ 30.9	+ 27.2	+ 23.8	+ 19.0
09	50 %	+ 15.0	+ 16.5	+ 19.3	+ 23.9	+ 28.8	+ 31.0	+ 32.7	+ 32.4	+ 29.8	+ 26.5	+ 22.4	+ 17.1
	85 %	+ 18.1	+ 20.1	+ 22.5	+ 27.4	+ 31.7	+ 33.7	+ 34.4	+ 34.6	+ 32.4	+ 28.7	+ 24.9	+ 19.9
10	50 %	+ 16.3	+ 17.7	+ 20.5	+ 25.4	+ 30.2	+ 32.5	+ 33.7	+ 34.0	+ 31.4	+ 28.0	+ 23.8	+ 18.3
	85 %	+ 19.4	+ 21.4	+ 23.8	+ 29.0	+ 33.2	+ 35.3	+ 35.9	+ 36.3	+ 34.0	+ 30.2	+ 26.4	+ 21.2
11	50 %	+ 17.6	+ 19.0	+ 21.8	+ 26.7	+ 31.4	+ 33.6	+ 35.0	+ 35.4	+ 33.0	+ 29.6	+ 25.1	+ 19.6
	85 %	+ 20.8	+ 22.7	+ 25.2	+ 30.4	+ 34.5	+ 36.4	+ 37.3	+ 37.8	+ 35.7	+ 31.9	+ 27.9	+ 22.5
12	50 %	+ 18.8	+ 20.1	+ 22.9	+ 27.9	+ 32.4	+ 34.7	+ 36.2	+ 36.7	+ 34.3	+ 30.9	+ 26.6	+ 20.7
	85 %	+ 22.0	+ 23.9	+ 26.3	+ 31.7	+ 35.5	+ 37.6	+ 38.5	+ 39.1	+ 37.1	+ 33.2	+ 29.3	+ 23.8
13	50 %	+ 19.7	+ 20.8	+ 23.6	+ 28.5	+ 33.0	+ 35.3	+ 36.8	+ 37.4	+ 35.2	+ 31.8	+ 27.6	+ 21.4
	85 %	+ 23.0	+ 24.6	+ 27.0	+ 32.3	+ 36.1	+ 38.2	+ 39.1	+ 39.8	+ 38.0	+ 34.2	+ 30.2	+ 24.3
14	50 %	+ 20.0	+ 21.1	+ 23.9	+ 28.9	+ 33.3	+ 35.6	+ 37.2	+ 37.8	+ 35.6	+ 32.2	+ 27.8	+ 21.7
	85 %	+ 23.3	+ 24.9	+ 27.3	+ 32.7	+ 36.6	+ 38.5	+ 39.5	+ 40.2	+ 38.6	+ 34.8	+ 30.6	+ 24.7
15	50 %	+ 19.9	+ 21.0	+ 23.8	+ 28.8	+ 33.2	+ 35.5	+ 37.1	+ 37.7	+ 35.5	+ 32.1	+ 27.7	+ 21.6
	85 %	+ 23.2	+ 24.8	+ 27.2	+ 32.6	+ 36.3	+ 38.4	+ 39.4	+ 40.1	+ 38.3	+ 34.5	+ 30.5	+ 24.6

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities)
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

BAHRAIN AIRPORT - Bahrain Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 19.8	+ 20.9	+ 23.6	+ 28.5	+ 32.9	+ 35.2	+ 36.8	+ 37.4	+ 35.3	+ 31.9	+ 27.6	+ 21.5
	85 % (2)	+ 23.1	+ 24.7	+ 27.0	+ 32.1	+ 36.0	+ 38.1	+ 39.1	+ 39.8	+ 38.0	+ 34.2	+ 30.3	+ 24.5
17	50 %	+ 19.6	+ 20.7	+ 23.4	+ 28.2	+ 32.5	+ 34.8	+ 36.5	+ 37.0	+ 34.9	+ 31.5	+ 27.3	+ 21.1
	85 %	+ 22.8	+ 24.4	+ 26.8	+ 32.0	+ 35.6	+ 37.7	+ 38.8	+ 39.4	+ 37.6	+ 33.8	+ 29.9	+ 24.3
18	50 %	+ 19.2	+ 20.2	+ 22.9	+ 27.6	+ 32.0	+ 34.1	+ 35.9	+ 36.4	+ 34.3	+ 30.9	+ 26.8	+ 20.8
	85 %	+ 22.4	+ 23.9	+ 26.2	+ 31.3	+ 35.0	+ 37.1	+ 38.2	+ 38.7	+ 36.9	+ 33.1	+ 29.4	+ 23.7
19	50 %	+ 18.8	+ 19.8	+ 22.4	+ 27.1	+ 31.4	+ 33.6	+ 35.4	+ 35.9	+ 33.7	+ 30.4	+ 26.3	+ 20.4
	85 %	+ 21.9	+ 23.4	+ 25.6	+ 30.7	+ 34.4	+ 36.4	+ 37.7	+ 38.2	+ 36.3	+ 32.6	+ 28.8	+ 23.3
20	50 %	+ 18.3	+ 19.3	+ 21.8	+ 26.3	+ 30.7	+ 32.9	+ 34.6	+ 35.0	+ 33.0	+ 29.6	+ 25.7	+ 19.9
	85 %	+ 21.4	+ 22.9	+ 24.9	+ 29.8	+ 33.6	+ 35.6	+ 36.8	+ 37.2	+ 35.3	+ 31.7	+ 28.2	+ 22.7
21	50 %	+ 17.8	+ 18.8	+ 21.2	+ 25.6	+ 29.8	+ 32.1	+ 33.9	+ 34.3	+ 32.2	+ 28.9	+ 25.1	+ 19.4
	85 %	+ 20.8	+ 22.3	+ 24.2	+ 29.0	+ 32.7	+ 34.8	+ 36.1	+ 36.5	+ 34.7	+ 31.0	+ 27.5	+ 22.2
22	50 %	+ 17.2	+ 18.2	+ 20.5	+ 24.8	+ 29.0	+ 31.2	+ 33.1	+ 33.3	+ 31.4	+ 28.0	+ 24.4	+ 18.8
	85 %	+ 20.2	+ 21.7	+ 23.6	+ 28.1	+ 31.8	+ 33.8	+ 35.3	+ 35.5	+ 33.8	+ 30.8	+ 26.8	+ 21.5
23	50 %	+ 16.6	+ 17.6	+ 19.9	+ 24.1	+ 28.3	+ 30.5	+ 32.6	+ 32.6	+ 30.6	+ 27.2	+ 23.7	+ 18.2
	85 %	+ 19.6	+ 21.1	+ 22.8	+ 27.3	+ 31.0	+ 33.0	+ 34.5	+ 34.7	+ 33.0	+ 29.2	+ 26.1	+ 20.9

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DOHA AIRPORT - Qatar Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 15.2	+ 16.2	+ 19.2	+ 21.8	+ 28.0	+ 31.5	+ 33.3	+ 33.0	+ 30.7	+ 26.6	+ 21.6	+ 16.8
	85 % (2)	+ 18.1	+ 19.2	+ 22.6	+ 27.1	+ 30.9	+ 34.0	+ 35.0	+ 34.8	+ 32.9	+ 28.6	+ 24.2	+ 19.5
01	50 %	+ 14.9	+ 15.5	+ 18.1	+ 22.9	+ 27.1	+ 30.5	+ 32.1	+ 32.0	+ 29.5	+ 25.5	+ 20.8	+ 16.1
	85 %	+ 17.5	+ 18.5	+ 21.7	+ 26.2	+ 30.0	+ 33.0	+ 34.0	+ 33.8	+ 31.7	+ 27.5	+ 23.9	+ 18.8
02	50 %	+ 13.9	+ 14.9	+ 17.6	+ 22.0	+ 26.1	+ 29.5	+ 31.4	+ 30.9	+ 29.0	+ 24.6	+ 20.1	+ 15.5
	85 %	+ 16.8	+ 17.9	+ 21.0	+ 25.3	+ 29.0	+ 32.0	+ 33.1	+ 32.7	+ 31.2	+ 26.6	+ 23.2	+ 18.2
03	50 %	+ 13.1	+ 14.2	+ 16.9	+ 21.1	+ 25.6	+ 28.9	+ 30.7	+ 30.2	+ 27.7	+ 23.8	+ 19.3	+ 14.8
	85 %	+ 16.2	+ 17.2	+ 20.3	+ 24.6	+ 28.5	+ 31.4	+ 32.4	+ 32.0	+ 29.9	+ 25.8	+ 22.4	+ 17.5
04	50 %	+ 12.8	+ 13.7	+ 16.5	+ 20.9	+ 25.2	+ 28.6	+ 30.4	+ 29.8	+ 27.2	+ 23.3	+ 18.8	+ 14.2
	85 %	+ 15.7	+ 16.7	+ 19.9	+ 24.2	+ 28.1	+ 31.1	+ 32.1	+ 31.6	+ 29.4	+ 25.3	+ 21.9	+ 17.0
05	50 %	+ 12.5	+ 13.5	+ 16.2	+ 20.7	+ 25.0	+ 28.2	+ 30.1	+ 29.5	+ 26.8	+ 22.9	+ 18.5	+ 14.1
	85 %	+ 15.4	+ 16.5	+ 19.6	+ 24.0	+ 27.9	+ 30.8	+ 31.8	+ 31.3	+ 29.0	+ 24.9	+ 21.6	+ 16.8
06	50 %	+ 12.3	+ 13.4	+ 16.1	+ 20.8	+ 25.4	+ 28.7	+ 30.2	+ 29.7	+ 26.7	+ 22.8	+ 18.4	+ 14.0
	85 %	+ 15.2	+ 16.5	+ 19.6	+ 24.2	+ 28.4	+ 31.3	+ 32.0	+ 31.6	+ 28.9	+ 24.8	+ 21.5	+ 16.7
07	50 %	+ 12.2	+ 13.5	+ 16.5	+ 21.5	+ 26.5	+ 29.8	+ 30.9	+ 30.4	+ 27.2	+ 23.2	+ 18.5	+ 14.1
	85 %	+ 15.1	+ 16.6	+ 20.1	+ 25.0	+ 29.6	+ 32.4	+ 32.7	+ 32.4	+ 29.5	+ 25.3	+ 21.6	+ 16.8

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DOHA AIRPORT - Qatar Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 12.6	+ 14.7	+ 17.6	+ 22.9	+ 28.0	+ 31.5	+ 32.3	+ 32.0	+ 28.6	+ 24.6	+ 19.3	+ 14.8
	85 % (2)	+ 15.6	+ 17.4	+ 21.3	+ 26.5	+ 31.2	+ 34.2	+ 34.1	+ 34.0	+ 30.9	+ 26.7	+ 22.5	+ 17.6
09	50 %	+ 13.8	+ 15.5	+ 19.2	+ 24.8	+ 30.0	+ 33.6	+ 34.2	+ 34.0	+ 30.7	+ 26.6	+ 20.8	+ 16.1
	85 %	+ 16.8	+ 18.7	+ 22.9	+ 28.5	+ 33.3	+ 36.4	+ 36.1	+ 36.0	+ 33.1	+ 28.8	+ 24.1	+ 18.9
10	50 %	+ 15.5	+ 17.3	+ 21.1	+ 27.0	+ 32.3	+ 36.0	+ 36.4	+ 36.4	+ 33.1	+ 28.9	+ 22.8	+ 17.9
	85 %	+ 18.5	+ 20.6	+ 24.9	+ 30.8	+ 35.7	+ 38.8	+ 38.3	+ 38.4	+ 35.5	+ 31.2	+ 26.2	+ 20.8
11	50 %	+ 17.3	+ 19.1	+ 23.0	+ 29.0	+ 34.1	+ 37.9	+ 38.4	+ 38.6	+ 35.5	+ 31.2	+ 24.8	+ 19.7
	85 %	+ 20.4	+ 22.4	+ 26.8	+ 32.8	+ 37.6	+ 40.8	+ 40.3	+ 40.7	+ 38.0	+ 33.6	+ 28.3	+ 22.6
12	50 %	+ 19.0	+ 20.7	+ 24.6	+ 30.7	+ 35.7	+ 39.6	+ 40.2	+ 40.5	+ 37.6	+ 33.2	+ 26.6	+ 21.3
	85 %	+ 22.1	+ 24.1	+ 28.3	+ 34.6	+ 39.3	+ 42.5	+ 42.1	+ 42.6	+ 40.2	+ 35.7	+ 30.2	+ 24.3
13	50 %	+ 20.2	+ 21.8	+ 25.6	+ 31.6	+ 36.7	+ 40.6	+ 41.1	+ 41.6	+ 38.9	+ 34.6	+ 27.8	+ 22.4
	85 %	+ 23.4	+ 25.3	+ 29.6	+ 35.5	+ 40.3	+ 43.6	+ 43.1	+ 43.8	+ 41.6	+ 37.0	+ 31.5	+ 25.4
14	50 %	+ 20.6	+ 22.2	+ 26.1	+ 32.7	+ 37.2	+ 41.1	+ 41.7	+ 42.2	+ 39.5	+ 35.0	+ 28.3	+ 22.8
	85 %	+ 23.8	+ 25.7	+ 30.1	+ 36.4	+ 40.8	+ 44.1	+ 43.7	+ 44.4	+ 42.2	+ 37.6	+ 32.0	+ 25.9
15	50 %	+ 20.5	+ 22.1	+ 26.0	+ 32.1	+ 37.1	+ 41.0	+ 41.6	+ 42.1	+ 39.6	+ 34.9	+ 28.2	+ 22.7
	85 %	+ 23.7	+ 25.6	+ 30.0	+ 36.1	+ 40.7	+ 44.0	+ 43.6	+ 44.3	+ 42.1	+ 37.5	+ 31.9	+ 25.8

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DOHA AIRPORT - Qatar Emirate

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 20.1	+ 21.9	+ 25.7	+ 31.6	+ 36.6	+ 40.5	+ 41.1	+ 41.6	+ 39.0	+ 34.5	+ 28.0	+ 22.5
	85 % (2)	+ 23.5	+ 25.4	+ 29.7	+ 35.6	+ 40.2	+ 43.5	+ 43.1	+ 43.8	+ 41.7	+ 37.1	+ 31.6	+ 25.6
17	50 %	+ 20.0	+ 21.6	+ 25.3	+ 31.2	+ 36.0	+ 39.8	+ 40.6	+ 41.0	+ 38.5	+ 34.0	+ 27.6	+ 22.2
	85 %	+ 23.2	+ 25.0	+ 29.2	+ 35.1	+ 39.6	+ 42.8	+ 42.6	+ 43.2	+ 41.2	+ 36.5	+ 31.1	+ 25.1
18	50 %	+ 19.5	+ 21.0	+ 24.6	+ 30.3	+ 35.1	+ 38.9	+ 39.8	+ 40.1	+ 37.6	+ 33.2	+ 26.9	+ 21.6
	85 %	+ 22.6	+ 24.4	+ 28.4	+ 34.1	+ 38.6	+ 41.8	+ 41.7	+ 42.2	+ 40.2	+ 35.6	+ 30.3	+ 24.6
19	50 %	+ 18.9	+ 20.3	+ 23.9	+ 29.5	+ 34.1	+ 37.9	+ 39.0	+ 39.3	+ 36.7	+ 32.3	+ 26.2	+ 20.9
	85 %	+ 22.0	+ 23.6	+ 27.6	+ 33.2	+ 37.5	+ 40.8	+ 40.8	+ 41.3	+ 39.2	+ 34.6	+ 29.5	+ 23.9
20	50 %	+ 18.7	+ 19.6	+ 23.0	+ 28.4	+ 33.1	+ 36.8	+ 37.8	+ 38.0	+ 35.5	+ 31.2	+ 25.4	+ 20.2
	85 %	+ 21.7	+ 22.8	+ 26.6	+ 32.0	+ 36.4	+ 39.6	+ 39.6	+ 39.9	+ 37.9	+ 33.6	+ 28.9	+ 23.1
21	50 %	+ 17.6	+ 18.8	+ 22.1	+ 27.3	+ 31.7	+ 35.3	+ 36.8	+ 36.8	+ 34.4	+ 30.1	+ 24.5	+ 19.4
	85 %	+ 20.5	+ 21.9	+ 25.6	+ 30.8	+ 34.9	+ 38.0	+ 38.6	+ 38.7	+ 36.7	+ 32.2	+ 27.7	+ 22.2
22	50 %	+ 16.8	+ 18.0	+ 21.1	+ 26.1	+ 30.4	+ 33.9	+ 35.5	+ 35.4	+ 33.1	+ 28.9	+ 23.6	+ 18.6
	85 %	+ 19.7	+ 21.0	+ 24.5	+ 29.5	+ 33.5	+ 36.5	+ 37.3	+ 37.2	+ 35.3	+ 30.9	+ 26.7	+ 21.3
23	50 %	+ 16.0	+ 17.1	+ 20.1	+ 25.0	+ 29.3	+ 32.8	+ 34.4	+ 34.3	+ 31.8	+ 27.7	+ 22.6	+ 17.7
	85 %	+ 18.9	+ 20.1	+ 23.5	+ 28.3	+ 32.3	+ 35.3	+ 36.1	+ 36.1	+ 34.0	+ 29.7	+ 25.7	+ 20.4

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

ABU DHABI AIRPORT -- Abu Dhabi Emirate - United Arab Emirates

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 17.6	+ 17.9	+ 21.4	+ 24.2	+ 27.9	+ 29.9	+ 32.2	+ 32.6	+ 30.9	+ 26.7	+ 23.0	+ 19.1
	85 % (2)	+ 19.7	+ 20.6	+ 24.4	+ 27.5	+ 30.7	+ 32.1	+ 34.6	+ 34.2	+ 32.9	+ 28.7	+ 25.1	+ 21.1
01	50 %	+ 16.8	+ 17.1	+ 20.5	+ 23.1	+ 27.0	+ 28.9	+ 31.4	+ 31.7	+ 29.8	+ 25.6	+ 22.1	+ 18.1
	85 %	+ 18.9	+ 19.8	+ 23.5	+ 26.6	+ 29.8	+ 31.1	+ 33.8	+ 33.3	+ 31.8	+ 27.6	+ 24.2	+ 20.1
02	50 %	+ 16.1	+ 16.1	+ 19.7	+ 22.4	+ 26.0	+ 28.0	+ 30.6	+ 30.8	+ 29.0	+ 24.8	+ 21.3	+ 17.6
	85 %	+ 18.2	+ 19.0	+ 22.7	+ 25.7	+ 28.8	+ 30.2	+ 33.0	+ 32.4	+ 31.0	+ 26.8	+ 23.4	+ 19.6
03	50 %	+ 15.4	+ 15.5	+ 19.0	+ 21.7	+ 25.5	+ 27.5	+ 29.9	+ 30.2	+ 28.1	+ 24.0	+ 20.4	+ 16.9
	85 %	+ 17.5	+ 18.2	+ 22.0	+ 25.0	+ 28.1	+ 29.7	+ 32.3	+ 31.8	+ 30.1	+ 26.0	+ 22.5	+ 18.9
04	50 %	+ 14.8	+ 14.9	+ 18.5	+ 21.1	+ 25.1	+ 27.1	+ 29.6	+ 29.8	+ 27.7	+ 23.5	+ 19.9	+ 16.4
	85 %	+ 17.0	+ 17.6	+ 21.5	+ 24.6	+ 27.9	+ 29.3	+ 32.0	+ 31.4	+ 29.7	+ 25.5	+ 22.0	+ 18.5
05	50 %	+ 14.4	+ 14.6	+ 18.2	+ 21.1	+ 24.9	+ 26.9	+ 29.4	+ 29.6	+ 27.3	+ 23.1	+ 19.5	+ 16.1
	85 %	+ 16.6	+ 17.1	+ 21.2	+ 24.4	+ 27.7	+ 29.1	+ 31.8	+ 31.2	+ 29.3	+ 25.1	+ 21.6	+ 18.2
06	50 %	+ 14.2	+ 14.5	+ 18.1	+ 21.2	+ 25.1	+ 27.1	+ 29.5	+ 29.7	+ 27.2	+ 23.0	+ 19.4	+ 16.0
	85 %	+ 16.5	+ 17.1	+ 21.1	+ 24.5	+ 28.2	+ 29.6	+ 32.0	+ 31.4	+ 29.3	+ 25.0	+ 21.6	+ 18.2
07	50 %	+ 14.1	+ 14.6	+ 18.5	+ 21.9	+ 26.4	+ 28.3	+ 30.1	+ 30.4	+ 27.7	+ 23.5	+ 19.5	+ 16.1
	85 %	+ 16.4	+ 17.4	+ 21.6	+ 25.1	+ 29.4	+ 30.6	+ 32.6	+ 32.1	+ 29.8	+ 25.6	+ 21.8	+ 18.4

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

ABU DHABI AIRPORT - Abu Dhabi Emirate - United Arab Emirates

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 14.6	+ 15.9	+ 19.7	+ 23.1	+ 27.9	+ 29.9	+ 31.4	+ 31.7	+ 29.0	+ 24.8	+ 20.4	+ 16.9
	85 % (2)	+ 16.9	+ 18.4	+ 22.9	+ 26.7	+ 31.0	+ 32.1	+ 34.0	+ 33.5	+ 31.2	+ 26.9	+ 22.7	+ 19.2
09	50 %	+ 16.0	+ 17.1	+ 21.4	+ 25.1	+ 29.9	+ 31.8	+ 33.1	+ 33.5	+ 30.9	+ 26.7	+ 22.1	+ 18.1
	85 %	+ 18.4	+ 20.0	+ 24.7	+ 28.6	+ 33.1	+ 34.1	+ 35.7	+ 35.3	+ 33.2	+ 28.9	+ 24.5	+ 20.6
10	50 %	+ 17.9	+ 19.2	+ 23.4	+ 27.1	+ 32.2	+ 34.1	+ 35.1	+ 35.6	+ 33.1	+ 29.0	+ 24.3	+ 20.3
	85 %	+ 20.1	+ 22.2	+ 26.8	+ 30.9	+ 35.4	+ 36.6	+ 37.8	+ 37.5	+ 35.4	+ 31.3	+ 26.7	+ 22.7
11	50 %	+ 20.1	+ 21.4	+ 25.5	+ 29.1	+ 34.0	+ 35.9	+ 36.9	+ 37.5	+ 35.3	+ 30.7	+ 26.6	+ 22.2
	85 %	+ 22.5	+ 24.5	+ 29.0	+ 33.0	+ 37.3	+ 38.4	+ 39.6	+ 39.4	+ 37.7	+ 41.1	+ 29.1	+ 24.6
12	50 %	+ 22.0	+ 23.1	+ 27.2	+ 31.0	+ 35.9	+ 37.9	+ 38.4	+ 39.2	+ 37.2	+ 33.2	+ 28.6	+ 24.0
	85 %	+ 24.4	+ 26.5	+ 30.8	+ 34.8	+ 38.8	+ 40.0	+ 41.2	+ 41.2	+ 39.6	+ 35.7	+ 31.1	+ 26.4
13	50 %	+ 23.4	+ 24.6	+ 28.1	+ 31.9	+ 36.5	+ 38.4	+ 39.3	+ 40.0	+ 38.4	+ 34.4	+ 29.9	+ 25.1
	85 %	+ 25.8	+ 27.8	+ 31.9	+ 35.8	+ 39.9	+ 41.0	+ 42.1	+ 42.0	+ 40.9	+ 37.0	+ 32.4	+ 27.5
14	50 %	+ 23.9	+ 25.1	+ 28.8	+ 32.5	+ 37.0	+ 38.9	+ 39.8	+ 40.6	+ 39.0	+ 35.0	+ 30.5	+ 25.6
	85 %	+ 26.3	+ 28.3	+ 32.5	+ 36.5	+ 40.4	+ 41.5	+ 42.7	+ 42.6	+ 41.5	+ 37.6	+ 33.0	+ 28.0
15	50 %	+ 23.8	+ 25.0	+ 28.7	+ 32.4	+ 36.9	+ 38.8	+ 39.7	+ 40.5	+ 38.9	+ 35.1	+ 30.4	+ 25.5
	85 %	+ 26.2	+ 28.2	+ 32.4	+ 36.5	+ 40.4	+ 41.4	+ 42.6	+ 42.5	+ 41.4	+ 37.7	+ 32.9	+ 27.9

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

ABU DHABI AIRPORT - Abu Dhabi Emirate - United Arab Emirates

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 23.6	+ 24.8	+ 28.4	+ 31.9	+ 36.4	+ 38.1	+ 39.1	+ 40.0	+ 38.5	+ 34.5	+ 30.2	+ 25.1
	85 % (2)	+ 26.0	+ 28.0	+ 32.1	+ 36.0	+ 39.9	+ 40.9	+ 42.2	+ 42.0	+ 41.0	+ 37.1	+ 32.7	+ 27.7
17	50 %	+ 23.2	+ 24.4	+ 27.9	+ 31.5	+ 35.8	+ 37.7	+ 38.9	+ 39.6	+ 38.1	+ 34.0	+ 29.7	+ 24.9
	85 %	+ 25.5	+ 27.6	+ 31.5	+ 35.6	+ 39.1	+ 40.1	+ 41.8	+ 41.6	+ 40.5	+ 36.5	+ 32.1	+ 27.1
18	50 %	+ 22.6	+ 23.6	+ 27.2	+ 30.7	+ 34.9	+ 36.9	+ 38.1	+ 38.8	+ 37.2	+ 33.2	+ 28.9	+ 24.2
	85 %	+ 24.9	+ 26.7	+ 30.8	+ 34.7	+ 38.1	+ 39.4	+ 40.9	+ 40.7	+ 39.6	+ 35.6	+ 31.1	+ 26.3
19	50 %	+ 21.9	+ 22.9	+ 26.4	+ 29.9	+ 34.0	+ 35.9	+ 37.4	+ 38.0	+ 36.4	+ 32.4	+ 28.1	+ 23.6
	85 %	+ 24.1	+ 25.9	+ 29.9	+ 33.8	+ 37.1	+ 38.4	+ 40.2	+ 39.9	+ 38.7	+ 34.7	+ 30.4	+ 25.9
20	50 %	+ 21.2	+ 22.1	+ 25.5	+ 28.7	+ 32.9	+ 34.8	+ 36.1	+ 36.9	+ 35.1	+ 31.3	+ 27.1	+ 22.8
	85 %	+ 23.4	+ 25.0	+ 28.9	+ 32.5	+ 36.1	+ 37.2	+ 39.0	+ 38.7	+ 37.9	+ 33.9	+ 29.6	+ 25.0
21	50 %	+ 20.4	+ 21.0	+ 24.5	+ 27.7	+ 31.6	+ 33.5	+ 34.4	+ 35.9	+ 34.1	+ 30.2	+ 26.2	+ 21.9
	85 %	+ 22.5	+ 23.8	+ 27.8	+ 31.4	+ 34.7	+ 35.9	+ 38.1	+ 37.7	+ 36.4	+ 32.3	+ 28.4	+ 24.0
22	50 %	+ 19.5	+ 20.1	+ 23.4	+ 26.4	+ 30.2	+ 32.2	+ 34.2	+ 34.7	+ 33.1	+ 29.0	+ 25.2	+ 21.0
	85 %	+ 21.6	+ 22.8	+ 26.6	+ 29.9	+ 33.2	+ 34.5	+ 36.8	+ 36.4	+ 35.1	+ 31.0	+ 27.3	+ 23.0
23	50 %	+ 18.5	+ 19.0	+ 22.4	+ 25.4	+ 29.1	+ 31.1	+ 33.1	+ 33.7	+ 31.9	+ 27.8	+ 24.1	+ 20.1
	85 %	+ 20.6	+ 21.7	+ 25.5	+ 28.8	+ 32.0	+ 33.4	+ 35.8	+ 35.4	+ 33.9	+ 29.8	+ 26.2	+ 22.1

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DUBAI AIRPORT - Dubai Emirate - United Arab Emirates

1. **HOURLY AVERAGES OF MONTHLY TEMPERATURES**, in °C, at 50 and 85% of probabilities

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
00	50 % (1)	+ 16.2	+ 17.2	+ 19.0	+ 21.6	+ 25.1	+ 27.8	+ 30.6	+ 31.1	+ 28.8	+ 25.1	+ 22.0	+ 18.1
	85 % (2)	+ 18.8	+ 19.7	+ 22.5	+ 24.5	+ 27.6	+ 30.1	+ 33.0	+ 33.1	+ 30.8	+ 27.1	+ 23.8	+ 20.0
01	50 %	+ 15.1	+ 16.4	+ 18.0	+ 20.6	+ 24.2	+ 26.9	+ 29.8	+ 30.2	+ 27.7	+ 24.1	+ 21.0	+ 17.2
	85 %	+ 17.9	+ 18.9	+ 21.5	+ 23.5	+ 26.7	+ 29.2	+ 32.2	+ 32.4	+ 29.7	+ 26.1	+ 22.8	+ 19.1
02	50 %	+ 14.4	+ 15.7	+ 17.1	+ 19.7	+ 23.1	+ 26.0	+ 29.0	+ 29.2	+ 26.8	+ 23.4	+ 20.1	+ 16.4
	85 %	+ 17.0	+ 18.2	+ 20.8	+ 22.6	+ 25.8	+ 28.1	+ 31.4	+ 31.4	+ 28.8	+ 25.2	+ 21.9	+ 18.1
03	50 %	+ 13.6	+ 14.9	+ 16.5	+ 19.0	+ 22.8	+ 25.6	+ 28.4	+ 28.5	+ 26.0	+ 22.6	+ 19.1	+ 15.5
	85 %	+ 16.2	+ 17.4	+ 20.0	+ 21.9	+ 25.1	+ 27.9	+ 30.8	+ 30.7	+ 28.0	+ 24.4	+ 20.9	+ 17.4
04	50 %	+ 13.0	+ 14.4	+ 16.0	+ 18.7	+ 22.4	+ 25.2	+ 28.1	+ 28.2	+ 25.5	+ 22.2	+ 18.6	+ 15.0
	85 %	+ 15.6	+ 16.9	+ 19.5	+ 21.6	+ 24.9	+ 27.5	+ 30.5	+ 30.4	+ 27.9	+ 24.0	+ 20.2	+ 16.9
05	50 %	+ 12.5	+ 14.1	+ 15.7	+ 18.4	+ 22.2	+ 25.0	+ 27.9	+ 27.9	+ 25.1	+ 21.8	+ 18.1	+ 14.6
	85 %	+ 15.1	+ 16.6	+ 19.2	+ 21.3	+ 24.7	+ 27.3	+ 30.3	+ 30.1	+ 27.1	+ 23.6	+ 19.9	+ 16.5
06	50 %	+ 12.3	+ 14.0	+ 15.6	+ 18.5	+ 22.6	+ 25.3	+ 28.0	+ 28.0	+ 25.0	+ 21.7	+ 17.9	+ 14.5
	85 %	+ 14.9	+ 16.6	+ 19.2	+ 21.5	+ 25.2	+ 27.7	+ 30.5	+ 30.3	+ 27.0	+ 23.5	+ 19.7	+ 16.4
07	50 %	+ 12.2	+ 14.1	+ 16.0	+ 19.2	+ 23.6	+ 26.3	+ 28.6	+ 28.7	+ 25.5	+ 22.2	+ 18.1	+ 14.6
	85 %	+ 14.8	+ 16.7	+ 19.7	+ 22.2	+ 26.1	+ 28.7	+ 31.1	+ 31.0	+ 27.5	+ 24.0	+ 19.9	+ 16.5

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DUBAI AIRPORT - Dubai Emirate - United Arab Emirates

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
08	50 % (1)	+ 12.7	+ 14.9	+ 17.1	+ 20.6	+ 25.1	+ 27.8	+ 29.8	+ 30.1	+ 28.8	+ 23.4	+ 19.1	+ 15.5
	85 % (2)	+ 15.4	+ 17.6	+ 21.1	+ 23.7	+ 27.9	+ 30.1	+ 32.1	+ 32.5	+ 28.9	+ 25.3	+ 21.0	+ 17.5
09	50 %	+ 14.1	+ 16.4	+ 19.0	+ 22.5	+ 27.0	+ 29.6	+ 31.4	+ 32.0	+ 28.8	+ 25.3	+ 21.0	+ 17.2
	85 %	+ 17.0	+ 19.1	+ 22.9	+ 25.6	+ 29.9	+ 32.1	+ 34.0	+ 34.4	+ 30.9	+ 27.2	+ 22.9	+ 19.2
10	50 %	+ 16.5	+ 18.4	+ 21.1	+ 24.7	+ 29.2	+ 31.7	+ 33.3	+ 34.2	+ 31.1	+ 27.5	+ 23.6	+ 19.4
	85 %	+ 19.3	+ 21.2	+ 25.1	+ 27.9	+ 32.2	+ 34.3	+ 35.9	+ 36.7	+ 33.3	+ 29.5	+ 25.6	+ 21.5
11	50 %	+ 19.0	+ 20.4	+ 23.1	+ 26.7	+ 31.0	+ 33.1	+ 34.0	+ 34.2	+ 33.4	+ 29.7	+ 26.1	+ 21.7
	85 %	+ 21.8	+ 23.2	+ 27.4	+ 30.0	+ 34.1	+ 35.9	+ 37.7	+ 38.7	+ 35.7	+ 31.8	+ 28.1	+ 23.8
12	50 %	+ 21.2	+ 22.2	+ 25.0	+ 28.5	+ 32.5	+ 34.8	+ 36.5	+ 36.0	+ 35.4	+ 31.8	+ 28.4	+ 23.7
	85 %	+ 24.1	+ 25.1	+ 29.2	+ 31.9	+ 34.7	+ 37.5	+ 38.2	+ 40.6	+ 37.8	+ 33.8	+ 30.5	+ 25.9
13	50 %	+ 22.7	+ 23.4	+ 26.1	+ 29.4	+ 33.4	+ 35.7	+ 37.1	+ 36.9	+ 36.6	+ 32.7	+ 30.0	+ 25.0
	85 %	+ 25.6	+ 26.1	+ 30.1	+ 32.9	+ 36.6	+ 38.4	+ 40.0	+ 41.5	+ 38.1	+ 35.0	+ 32.2	+ 27.2
14	50 %	+ 23.1	+ 23.9	+ 26.7	+ 30.0	+ 33.9	+ 36.1	+ 37.8	+ 39.5	+ 37.2	+ 33.3	+ 30.6	+ 25.6
	85 %	+ 26.2	+ 26.8	+ 30.9	+ 33.6	+ 37.1	+ 38.8	+ 40.5	+ 42.1	+ 39.7	+ 35.8	+ 32.8	+ 27.8
15	50 %	+ 23.2	+ 23.8	+ 26.6	+ 29.9	+ 33.8	+ 36.0	+ 37.7	+ 39.4	+ 37.1	+ 33.2	+ 30.9	+ 25.5
	85 %	+ 26.1	+ 26.7	+ 30.8	+ 33.5	+ 37.0	+ 38.7	+ 40.4	+ 42.0	+ 39.6	+ 35.5	+ 32.7	+ 27.7

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

DUBAI AIRPORT - Dubai Emirate - United Arab Emirates

3. HOURLY AVERAGES OF MONTHLY TEMPERATURES, in °C, at 50 and 85% of probabilities.

Local time	Probabilities at	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
16	50 % (1)	+ 21.0	+ 21.6	+ 26.1	+ 29.4	+ 33.1	+ 35.5	+ 37.1	+ 38.9	+ 36.8	+ 32.8	+ 30.2	+ 25.1
	85 % (2)	+ 25.9	+ 26.5	+ 30.5	+ 33.0	+ 36.5	+ 38.2	+ 40.0	+ 41.5	+ 39.1	+ 35.1	+ 32.4	+ 27.5
17	50 %	+ 22.5	+ 23.2	+ 25.8	+ 28.9	+ 32.7	+ 35.0	+ 36.9	+ 38.4	+ 36.2	+ 32.4	+ 29.7	+ 24.8
	85 %	+ 25.4	+ 26.1	+ 29.9	+ 32.5	+ 36.9	+ 37.7	+ 39.6	+ 41.0	+ 38.7	+ 34.7	+ 31.8	+ 27.0
18	50 %	+ 21.9	+ 22.5	+ 25.0	+ 28.1	+ 31.9	+ 34.2	+ 36.2	+ 37.6	+ 35.4	+ 31.6	+ 28.8	+ 24.0
	85 %	+ 24.7	+ 25.3	+ 29.0	+ 31.6	+ 35.0	+ 36.8	+ 38.8	+ 40.1	+ 37.8	+ 33.8	+ 30.9	+ 26.1
19	50 %	+ 21.1	+ 21.8	+ 24.1	+ 27.3	+ 31.0	+ 33.1	+ 35.5	+ 36.8	+ 34.5	+ 30.7	+ 27.9	+ 23.2
	85 %	+ 23.9	+ 24.6	+ 28.2	+ 30.7	+ 34.0	+ 35.9	+ 38.1	+ 39.3	+ 36.8	+ 32.8	+ 29.9	+ 25.1
20	50 %	+ 20.2	+ 21.0	+ 23.3	+ 26.4	+ 29.9	+ 32.1	+ 34.5	+ 35.6	+ 33.4	+ 29.7	+ 26.9	+ 22.4
	85 %	+ 22.9	+ 23.7	+ 27.1	+ 29.4	+ 32.8	+ 34.8	+ 37.1	+ 38.0	+ 35.8	+ 31.7	+ 28.9	+ 24.4
21	50 %	+ 19.3	+ 20.1	+ 22.3	+ 25.1	+ 28.6	+ 31.1	+ 33.6	+ 34.6	+ 32.3	+ 28.7	+ 25.7	+ 21.3
	85 %	+ 22.0	+ 22.7	+ 26.0	+ 28.1	+ 31.4	+ 33.6	+ 36.1	+ 37.0	+ 34.4	+ 30.6	+ 27.6	+ 23.3
22	50 %	+ 18.3	+ 19.2	+ 21.1	+ 23.8	+ 27.2	+ 29.9	+ 32.5	+ 33.3	+ 31.1	+ 27.5	+ 24.6	+ 20.3
	85 %	+ 20.9	+ 21.7	+ 24.7	+ 26.9	+ 29.9	+ 32.3	+ 35.0	+ 35.6	+ 33.1	+ 29.3	+ 26.4	+ 22.2
23	50 %	+ 17.2	+ 18.2	+ 20.0	+ 22.7	+ 26.1	+ 28.9	+ 31.6	+ 32.2	+ 29.9	+ 26.3	+ 23.3	+ 19.2
	85 %	+ 19.8	+ 20.7	+ 23.5	+ 25.7	+ 28.9	+ 31.1	+ 34.1	+ 34.5	+ 31.9	+ 28.1	+ 25.1	+ 21.1

(1) Average monthly values of daily AVERAGE hourly temperatures (axis at 50% of probabilities).
(2) Average monthly values of daily MAXIMAL hourly temperatures (above values increased by the value of an average monthly thermal standard deviation, this value being itself weighted as a function of the time block involved).

END

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